

CHAPTER 8

DISCOMFORT ASSOCIATED WITH ENVIRONMENTAL TOBACCO SMOKE

William S. Cain PhD

John B. Pierce Laboratory and Yale University
New Haven, CT 06519

Introduction

The atmosphere inside buildings contains many chemicals generated by the presence and activities of people. People's bodies give off small quantities of organic materials in the breath and from the skin and alimentary tract. Although a chemical analysis may reveal hundreds or even thousands of materials, we usually perceive them in the aggregate as what we call occupancy odor. We often notice it consciously when we enter a hot, muggy room. Nevertheless, occupancy odor exists in occupied spaces at essentially all other times, but remains at a low level because of ventilation with outside air (Yaglou, Riley, and Coggins, 1936). When engineers and public health specialists began to study ventilation requirements for buildings quantitatively, they started with the smell of occupancy (Cain, 1979). The fresh-air requirements so derived exceeded those based on metabolically-relevant gases (oxygen, carbon dioxide) several-fold.

In general, occupancy odor poses a mild challenge to the HVAC engineer. (HVAC refers to heating, ventilating, and air-conditioning.) This odor constitutes the baseline case. Anything else that people do in the space will increase ventilation requirements. This would include cooking, painting, operating machines (e.g., photocopier), woodworking, smoking, and so on. Of these various activities, smoking has traditionally been the most common. In a questionnaire study of odor problems in such spaces, Leonardos and Kendall (1971) stated, "Tobacco smoke is by far the most important odor contributor in enclosed space as indicated by the consistent agreement of the panel [principally experts in HVAC], and by their rankings. Also, it is considered a problem in virtually all (11 of 14) of the enclosed spaces" (p. 101). Tobacco smoke has accordingly received considerable attention historically in studies of odor control via ventilation or filtration (e.g., Yaglou, 1955; Kerka and Humphreys, 1956; Weber, Jermini, and Grandjean, 1976).

As he has with occupancy odor, the HVAC engineer has confronted environmental tobacco smoke (ETS) via its sensory characteristics, i.e., its odor and irritation, rather than via its chemical or physical complexity. The chemical complexity of ETS likely exceeds that of emissions from bodies and chemical

analysis of ETS-containing air has offered little of practical significance regarding specific chemicals responsible for its odor or irritation. Specification of the relevant chemicals might, however, assist in the mitigation of offending characteristics (National Research Council, 1986).

In what follows, we shall review how human beings perceive ETS. We shall ask: How much ventilation air must be introduced into a space in order to satisfy visitors to that space? Will the amount of air required by smokers differ from that required by nonsmokers? Does ETS-odor decay spontaneously after smoking ceases? Do occupants accustomed to the environment impose less stringent criteria for ventilation than visitors fresh from a nonsmoking space? Does the odor and irritation of ETS come from the smoke particles or from the vapors that accompany the particles? Does filtration offer opportunities for control?

Ventilation Requirements Based on Responses of the 'Visitor'

A customary setting to explore how indoor contaminants affect the senses is a climate-controlled environmental chamber with relatively inert surfaces, e.g., aluminum or stainless steel, and variable ventilation. Such a model environment offers control over the physical and chemical characteristics at the expense of what we may call ecological realism, i.e., an everyday setting. For the study of occupancy odor, human beings occupy the chamber in order to generate the odor of interest. Judges may enter the chamber briefly or may place their faces into a box fed with the atmosphere of the chamber. (In so sampling the atmosphere, the judges essentially visit the space.) The odor judgment may comprise a mark on an annotated rating scale (e.g., 'no odor' to 'overpowering odor') or the choice of a matching odor intensity. The latter judgment generally entails the use of a device called an olfactometer that delivers the vapor of some standard odorant, such as n-butyl alcohol (1-butanol), at various concentrations. A matching odor has the advantage of reproducibility from lab to lab.

Many modern investigations also obtain judgments of acceptability in order to 'calibrate' intensity judgments. Acceptability judgments address the question: How many people will object to any given level of odor (or irritation)? The answer will depend on individual differences in olfactory sensitivity and on esthetic criteria. Whereas we can expect average intensity judgments to remain constant through the decades for any fixed stimulus, we can expect acceptability judgments to shift somewhat with prevailing standards. Three or more decades ago, when approximately half the adult population smoked and when restrictions on smoking were relatively few, people seemed more tolerant of tobacco smoke odor than today (see Cain, 1979).

Figure 1 depicts how occupancy odor varied with

ventilation rate per occupant under nonsmoking occupancy in a study conducted in a 1200-ft³ climate chamber (Cain, Leaderer, Isseroff, Berglund, Huey, Lipsitt, and Perlman, 1983). Visitors made judgments of air circulated through an outside sampling-box and were therefore naive to the conditions of occupancy. The scale refers to the concentration of 1-butanol matched to the occupancy odor present after one hour of occupancy. Just as odor level decreased with increases in ventilation rate, so also did dissatisfaction, i.e., judgments that the odor was unacceptable. The point of 20% dissatisfaction holds special interest.

The ventilation standard of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (1989) recommends a maximum of 20% dissatisfaction among visitors to a space. By this criterion, the data from the investigation imply the need for 17 cfm per occupant. The ASHRAE standard suggests 15 cfm or more per occupant for most spaces, e.g., 15 cfm for classrooms, libraries, auditoriums, dormitories; 20 cfm for offices, conference rooms, dining rooms, lobbies; 25 cfm for discos, beauty shops; 30 cfm for bars, casinos; 60 cfm for smoking lounges (see Fig. 2). Hence, practice coincides with the experimental data about as well as could be expected regarding the baseline case.

When cigarettes were smoked in the climate chamber, odor level increased markedly. Figure 3 displays ETS odor for various conditions of smoking: intermittent (4 cig per hr) or continuous (8 or 16 cig per hr). As Fig. 4 shows, the degree of dissatisfaction mirrored the higher odor level. Based on the rule of 20% maximum dissatisfaction, the ventilation rate required per cigarette during active smoking exceeded 4,000 ft³. In order to convert ventilation per cigarette into ventilation rate per person for typical conditions of occupancy in a 'smoking-permitted' space, it was assumed that 10% of occupants would be smoking at any given time (see Repace and Lowrey, 1980). The resulting ventilation rate equalled 53 cfm, three times that for nonsmoking occupancy. (The average smoking rate will of course vary and the estimate of 10% may be high for 1990. The assumption of a lower rate of smoking would entail a proportional change in rate of ventilation.)

Does the higher ventilation rate for smoking imply that the judges in the investigation showed a special aversion to the odor of cigarettes? Apparently not. The judges, one-third of whom were smokers and two-thirds of whom were not, seemed to base their dissatisfaction strictly on odor intensity. Degree of dissatisfaction varied with odor intensity in the same way for both occupancy odor and tobacco smoke odor (Fig. 5). Stronger odors meant greater dissatisfaction irrespective of odor type.

How well does the higher rate implied by the investigation compare with the ASHRAE standard? As indicated above, the standard recommended 60 cfm per occupant in a smoking

Draft - Do not cite or quote

lounge, where presumably most or all occupants will be smoking. If 100% rather than 10% were smoking simultaneously, then the rate would need exceed an unachievable 500 cfm per occupant. If 50% were smoking, perhaps a more realistic expectation, then the rate would need to exceed a still unachievable 250 cfm per occupant. (The maximum achievable rate for typical design occupancy in a mechanically-ventilated space will usually equal about 60 cfm per occupant, though as discussed below a generous allotment of space per person can increase that value.) Fortunately, however, the smoker seems less concerned about the odor of ETS than the nonsmoker. As it turns out, smokers as a group seem satisfied with about one quarter the ventilation air of a mixed group containing a typical proportion of smokers and nonsmokers. Hence, a rate of 60 cfm per occupant may actually almost meet the customary ASHRAE criterion of a maximum of 20% dissatisfaction.

How about nonsmokers? Just as a group of smokers will hold a less stringent criterion than the mixed group, a group of nonsmokers will hold a more stringent criterion. The data from the investigation suggest that with 10% smoking at any given time, nonsmokers would need over 100 cfm per occupant to hold dissatisfaction at only 20%. At the present time, we do not know whether the difference between smokers and nonsmokers derives from olfactory sensitivity to ETS or to esthetic criteria.

Clausen (1986) confirmed differences in tolerance of ETS odor between smokers and nonsmokers. For any given level of odor (expressed as concentration of butanol), a group of nonsmokers expressed much more dissatisfaction than smokers (Fig. 6). Both groups exhibited a lawful relation between odor intensity and dissatisfaction, but the difference between the groups grew as odor level increased. At the point where 20% of smokers expressed dissatisfaction, almost half of nonsmokers did so.

As ETS enters the atmosphere, its many chemical constituents react with each other and with surrounding materials both chemically and physically. Does this behavior change the nature of the contaminant over time? Yes and no. Irrespective of whatever chemical changes occur, the odor of ETS behaves in the short run like a stable contaminant. After the source has been removed, ETS odor decays in a manner entirely predictable from ventilation rate (Clausen, Fanger, Cain, and Leaderer, 1985). In this respect, it differs from occupancy odor which has a half-life of 55 min, presumably dictated by slow oxidation of its chemical constituents into less odorous products (Clausen, Fanger, Cain, and Leaderer, 1986). ETS odor offers no such easy benefit to the engineer. Indeed, when ventilation fails to eliminate the contaminant entirely, ETS carries a penalty derived from its physical interaction with surfaces. Because the ETS aerosol adsorbs strongly to walls, fabrics, and so on, it becomes a source of odor later. The background odor of the emitted products carries its own demands for ventilation, predictable in part from the

typical amount of smoking in a space (Clausen, Møller, Fanger, Leaderer, and Dietz, 1986).

In a laboratory situation where other sources of combustion can be eliminated, carbon monoxide can offer a gross index of level of ETS. Figure 6 shows that Clausen could relate dissatisfaction to concentration of carbon monoxide in ETS as well as to matched level of butanol. This occurred because of a strong correlation ($r > 0.90$) between odor intensity and incremental carbon monoxide due to smoking. Such a relationship makes it possible, within limits imposed by brand-to-brand variability in emitted carbon monoxide, to compare one study to another. We can ask, at what concentration of carbon monoxide will ETS reach a given level of dissatisfaction in one or another group? As Fig. 6 revealed, the concentration at which 20% of nonsmokers expressed dissatisfaction fell about eight times below that at which 20% of smokers expressed dissatisfaction.

Responses of Occupants

Up to this point, we have concerned ourselves only with the reactions of visitors. Standards for ventilation have focused on the reactions of the visitor, rather than those of the occupant, because the visitor will have a more sensitive, and hence more critical, nose than the person adapted to the contaminant. On the other hand, a focus on the visitor sidesteps another important time-dependent sensory response of the occupant, irritation. Whereas air containing an irritant may seem only barely irritating at first, it may become intolerably so over time.

Figure 7 illustrates the time-course of eye irritation experienced by occupants exposed to ETS at constant concentrations of 2 or 5 ppm carbon monoxide, used here as a tracer in the manner mentioned above (Cain, Tosun, See, and Leaderer, 1987). The lower concentration led to slight, though statistically significant, irritation above pre-smoking baseline. The higher concentration led to irritation that increased over time in sensory magnitude and caused an increasing degree of dissatisfaction. Whereas essentially none of the occupants found the irritation objectionable at first, by the end of an hour about 30% found it so. In an extension, Clausen, Nielsen, Sahin, and Fanger (1987) found that an asymptotic level of 20% dissatisfaction would occur at a concentration of 3.8 ppm carbon monoxide. A comparison with the odor judgments of visitors in Fig. 6 reveals that only smokers would find such a level tolerable by the '20% rule.' Clausen et al. estimated that the ventilation rate necessary to control irritation of occupants to a dissatisfaction of 20% would equal only one-tenth of that needed to control odor perceived by visitors to the same level of dissatisfaction.

Although Clausen et al. did not argue in favor of

lowering ventilation to meet only the dissatisfaction of occupants, there could exist some temptation to do so (see Winneke, Plischke, Roscovanu, and Schlipkoeter, 1984). Cain et al. (1987) cautioned against the temptation to see irritation and odor in the same light:

Apart from the issue of whether visitors or occupants are more sensitive, there exists a question regarding whether the '20% rule' should govern dissatisfaction based on irritation just as it governs dissatisfaction based on odor alone. Whereas odor may be interpretable narrowly on grounds of comfort, irritation would seem interpretable on grounds of health. Some people may find themselves quite neutral with respect to one or another odor, but no one could plausibly argue neutrality with respect to burning eyes. It could be argued, therefore, that any consistent irritation above baseline should be deemed unacceptable. [p.352]

Applicability of Chamber Studies

The data presented above may raise two issues of concern: 1) Should chamber studies influence ventilation policy in view of their remoteness from real-world circumstances? and 2) Would small errors in the results lead to large differences in recommended policies? The first issue has no simple answer. In the real world, people engage in such a wide variety of activities that any single field study, even assuming accurate execution, would itself have very limited generality. Only a set of field studies with a variety of scenarios could even approach the generality desired. Such field studies have not been done.

A group of subjects sitting in a chamber with no task other than to focus attention on odors might seem likely to behave very conservatively, i.e., to judge even weak odors unacceptable, which would in turn imply the need for high ventilation rates. We can neither confirm nor deny this tendency, though circumstantial evidence runs against it. As already noted, visitors in Cain et al.'s (1983) study found ETS odor no more objectionable than occupancy odor at the same perceived intensity. Could this just mean that subjects treat each odor equally conservatively? Unlikely, since the recommended ventilation rates for occupancy odor from that study converge with a great deal of other lab and field evidence regarding the need for about 15 to 20 cfm of ventilation per occupant.

Even if the chamber experiment happened to encourage conservatism, persons who choose to participate in it and hence to expose themselves to potentially aversive environmental odors may represent a less reactive fraction of the population. Persons who find ETS odor aversive, for example, would seem unlikely to accept such work. Concern about these matters might, however, stimulate some productive research into the demographic factors

that govern reactivity to indoor odors.

Chamber experiments on ETS can be criticized because they have explored levels that largely exceed those of everyday life. The tendency to explore high levels derives in part from a desire to cover a wide range of conditions and in part from crude estimates of levels of smoking in the countries and during the eras when the experiments were performed. Even just ten years ago, smoking in the U.S.A. occurred more commonly and at higher levels than today. In countries such as Denmark, the location of some recent studies, smoking occurs with a higher frequency and with fewer restrictions than in the U.S.A.

Some recent field surveys have found surprisingly low levels of ETS in common spaces, e.g., offices (Kirk, Hunter, Back, Lester, and Perry, 1988; Oldaker, 1989). In order to understand how to relate the chamber studies with such field data, we need to factor in the ventilation rates in the field (see Nystrom and Green, 1986, for a discussion of variables relevant to the evaluation of ETS). Although a building code may specify a ventilation rate of, say, 20 cfm per occupant, the actual per-occupant rate will depend on the number of occupants actually in the space. If a space typically contains only one-third the design number of occupants, the ventilation rate will equal 60 cfm per person. This situation occurs frequently since the design occupancy listed in a standard commonly comes from fire regulations regarding maximum density of occupancy. Accordingly, one cannot argue, as has been done, that a putative low frequency of complaints in field settings offers evidence against the recommendations of chamber studies and in favor of lower per-occupant rates. Field data, if collected in spaces occupied well below design levels and if reported without actual per-occupant ventilation rates, can give the illusion that rates of ventilation suitable for occupancy odor can lead to adequate control of ETS odor. When normalized to a per-cigarette ventilation rate and hence when seen without assumptions regarding occupancy, chamber studies have probably yielded quite valid data, irrespective of the levels of smoking explored.

Regarding the second concern mentioned at the beginning of this section, small errors in the estimate of dissatisfaction could in fact lead to large errors in recommended rate of ventilation since the relation between percent dissatisfaction and ventilation rate for ETS has a rather low slope (Fig. 4). Merely on general grounds, it would seem advisable to replicate this relation with new participants in order to check its stability and validity.

Alternatives to Ventilation

It might seem intuitively reasonable that the odor of ETS should come from its vapor phase and the irritation from

its particulate phase. At one time this seemed likely, but recent investigations that have employed electrostatic air cleaning have shown clearly that the gas phase accounts for the majority of odor and irritation (cf. Hugod, 1984; Weber, 1984). Comparison of the right and left sides of Fig. 7 will reveal that elimination of the particulate phase had only a trivial effect on the eye irritation caused ETS at 2 and 5 ppm carbon monoxide (Cain, Tosun, See, and Leaderer, 1987). The same held true for judgments of odor and of nose and throat irritation. Clausen, Nielsen, Sahin, and Fanger (1987) confirmed these results. In finding that particles played essentially no role in odor, both investigations also confirmed Clausen et al.'s (1985) earlier experiments with visitors. Hence, particle filtration holds no promise for immediate elimination of the discomfort of ETS. The major advantage of such air cleaning will derive from reduction of haze and collection of 'tar' that would otherwise adsorb elsewhere in the space.

Although both the odor and irritation of ETS come from the vapor phase, the chemical constituents that give rise to the one probably do not give rise to the other. Undoubtedly, the odor comes from a very large number of constituents. The sense of smell will respond to almost all airborne organic materials present in sufficient concentration (Cain, 1988). For one substance, however, a 'sufficient concentration' may fall a millionfold below that of another. Furthermore, individual constituents will combine perceptually in mixtures in complicated, nonlinear ways. Although one or a few materials could in principle dominate the odor, it seems unlikely.

Many fewer materials can cause irritation at the concentrations present in ETS and its irritation could realistically arise from a few or perhaps even one constituent. Little is known about how irritants combine with each other perceptually though it is known that odor and irritation interact (Cain and Murphy, 1980). Irritation can suppress the perception of odor and vice versa (Cain, See, and Tosun, 1986). In so far as irritation may have a less complex origin than odor, it may offer easier opportunities for control through filtration. As yet, however, experiments on the origin of ETS have told more about what fails to cause irritation than about what causes it (Weber, Jermini, and Grandjean, 1976; Weber-Tschopp, Fischer, and Grandjean, 1977; Weber-Tschopp, Fischer, Gierer, and Grandjean, 1977; Hugod, Hawkins, and Astrup, 1978).

The complexity of ETS more or less guarantees that almost any means of air cleaning will eliminate part of it, even though no simple procedure will eliminate all of it. Through the use of air washing that presumably eliminated some water-soluble constituents, Clausen, Møller, and Fanger (1987) achieved some reduction in level of dissatisfaction though not in the perceived intensity of ETS. The air-washed ETS smelled fresher. The results offered little encouragement for the use air-washing alone, but

showed that the odor character of ETS can play some role in degree of acceptance.

Undoubtedly, a combination of particulate air cleaning and vapor-phase cleaning via adsorption on activated carbon or via chemisorption on oxidant-impregnated alumina can control both the irritation and odor of ETS to some degree. Unfortunately, there exist no standards to assess the efficacy of vapor-phase filtration media. The installation of such media occurs more commonly in special environments, e.g., libraries and computer facilities, under expert guidance than in spaces designed for general occupancy. In the overwhelming majority of cases, attempts to control ETS rely on ventilation (dilution). As we have seen, however, ventilation has its limitations.

SUMMARY

1. At an average smoking rate of 10% smoking at any one time, nonsmokers would need in excess of 100 cfm/occupant to hold dissatisfaction to the ASHRAE criterion of 20% odor acceptability.
2. Exposure to ETS generates odor and irritation in both nonsmokers and smokers. Nonsmokers as a group are less tolerant of ETS than smokers.
3. The irritation and odor from ETS appear to reside in the vapor phase. The control of ETS irritation and odor by ventilation or air cleaning can provide only limited results.

References

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (1989). Ventilation for Acceptable Indoor Air Quality. ANSI/ASHRAE 62-1989. Atlanta: ASHRAE.

Cain, W. S. (1979). Ventilation and odor control: prospects for energy savings. ASHRAE Transactions, 85 (1), 784-792.

Cain, W. S. (1988). Olfaction. In R. C. Atkinson, R. J. Herrnstein, G. Lindzey, and R. D. Luce (Eds.), Stevens' Handbook of Experimental Psychology, Vol. 1: Perception and Motivation, rev. ed. New York: Wiley. Pp. 409-459.

Cain, W. S. and Murphy, C. L. (1980). Interaction between chemoreceptive modalities of odour and irritation. Nature, 284, 255-257.

Cain, W. S., See, L.-C., and Tosun, T. (1986). Irritation and odor from formaldehyde: chamber studies. In IAQ '86: Managing Indoor Air for Health and Energy Conservation. Atlanta: ASHRAE. Pp. 126-137.

Cain, W. S., Tosun, T., See, L.-C., and Leaderer, B. (1987). Environmental tobacco smoke: sensory reactions of occupants. Atmospheric Environment, 21, 347-353.

Cain, W. S., Leaderer, B. P., Isseroff, R., Berglund, L. G., Huey, R. J., Lipsitt, E. D., and Perlman, D. (1983). Ventilation requirements in buildings - I. Control of occupancy odor and tobacco smoke odor. Atmospheric Environment, 17, 1183-1197.

Clausen, G. H. (1986). Tobaksrøg - lugtgener og ventilationsbehov. Doctoral thesis, Technical University of Denmark.

Clausen, G. H., Fanger, P. O., Cain, W. S., and Leaderer, B. P. (1985). The influence of aging, particle filtration and humidity on tobacco smoke odor. In P. O. Fanger (Ed.), Clima 2000, Volume 4: Indoor Climate. Copenhagen: VVS Kongres - VVS Messe. Pp. 345-349.

Clausen, G. H., Fanger, P. O., Cain, W. S., and Leaderer, B. P. (1986). Stability of body odor in enclosed spaces. Environment International, 12, 201-205.

Clausen, G. H., Møller, S. B., Fanger, P. O., Leaderer, B. P., and Dietz, R. (1986). Background odor caused by previous tobacco smoking. In IAQ '86: Managing Indoor Air for Health and Energy Conservation. Atlanta: ASHRAE. Pp. 119-125.

Clausen, G. H., Møller, S. B., and Fanger, P. O. (1987). The impact of air washing on environmental tobacco smoke odor. In B. Seifert, H. Esdorn, M. Fischer, H. R_{den}, and J. Wegner (Eds.), Indoor Air '87, Volume 2. Berlin: Institute for Water, Soil and Air Hygiene. Pp. 47-51.

Clausen, G. H., Nielsen, K. S., Sahin, F., and Fanger, P. O. (1987). Sensory irritation from exposure to environmental tobacco smoke. In B. Seifert, H. Esdorn, M. Fischer, H. R_{den}, and J. Wegner (Eds.), Indoor Air '87, Volume 2. Berlin: Institute for Water, Soil and Air Hygiene. Pp. 52-56.

Hugod, C. (1984). Indoor air pollution with smoke constituents - an experimental investigation. Preventive Medicine, 13, 582-588.

Hugod, C., Hawkins, L. H., and strup, P. (1978). Exposure of passive smokers to tobacco smoke constituents. International Archives of Occupational and Environmental Health, 42, 21-29.

Kerka, W. F. and Humphreys, C. M. (1956). Temperature and humidity effect on odor perception. Heating, Piping, and Air Conditioning, 28, 128-136.

Kirk, P. W. W., Hunter, M., Baek, S. O., Lester, J. N., and Perry, R. (1988). Environmental tobacco smoke in indoor air. In R. Perry and P. W. W. Kirk (Eds.), Indoor and Ambient Air Quality. London: Selper. Pp. 99-112.

Leonardos, G. and Kendall, D. A. (1971). Questionnaire study on odor problems of enclosed space. ASHRAE Transactions, 77 (1), 101-112.

Leopold, C. S. (1945). Tobacco smoke control - A preliminary study. ASHVE Transactions, 51, 255-270.

National Research Council (1986). Environmental Tobacco Smoke - Measuring Exposures and Assessing Health Effects. Washington: National Academy Press.

Nystrom, C. W. and Green, C. R. (1986). Assessing the impact of environmental tobacco smoke on indoor air quality. In IAQ '86: Managing the Indoor Air for Health and Energy Conservation. Atlanta: American Society of Heating, Refrigerating, and Air-Conditioning Engineers. Pp. 213-233.

Oldaker, G. B. (1989). Environmental tobacco smoke (ETS): How much is in the air? Presented at the International Tobacco Conference Minisymposium on Environmental Tobacco Smoke and Scientific Affairs, Winston-Salem, NC.

Repace, J. L. and Lowry, A. H. (1980). Indoor air pollution, tobacco smoke, and public health. Science, 208, 464-472.

Weber, A. (1984). Annoyance and irritation by passive smoking. Preventive Medicine, 13, 618-625.

Weber, A., Jermini, C., Grandjean, E. (1976). Irritating effects on man of air pollution due to cigarette smoke. American Journal of Public Health, 66, 672-676.

Weber-Tschopp, A., Fischer, T., Grandjean, E. (1977). Reizwirkungen des Formaldehyds (HCHO) auf den Menschen. (Irritating effects of formaldehyde on men.) International Archives of Occupational and Environmental Health, 39, 207-218.

Weber-Tschopp, A., Fischer, T., Gierer, R., and Grandjean, E. (1977). Experimentelle Reizwirkungen von Akrolein auf den Menschen. (Experimentally induced irritating effects of acrolein on men.) Archives of Occupational and Environmental Health, 40, 117-130.

Winneke, G., Plischke, K., Roscovanu, A., and Schlipkoeter, H.-W. (1984). Patterns and determinants of reaction to tobacco smoke in an experimental exposure setting. In B. Berglund, T. Lindvall, and J. Sundell (Eds.), Indoor Air, Vol. 2. Stockholm: Swedish Council for Building Research. Pp. 351-356.

Yaglou, C. P. (1955). Ventilation requirements for cigarette smoke. ASHAE Transactions, 61, 25-32.

Yaglou, C. P., Riley, E. C., and Coggins, E. I. (1936). Ventilation requirements. ASHAE Transactions, 42, 133-162.

Figure Captions

Figure 1. Showing the relation between level of occupancy odor (indicated by concentration of 1-butanol matched to the odor) and ventilation rate per occupant when 4 to 12 persons occupied a climate chamber for an hour (filled squares). Judgments of odor were made by visitors who sampled the air of the chamber at a remote sampling box. Also shown (unfilled squares) is the frequency of dissatisfaction expressed by the visitors in response to the question, Is the air acceptable or unacceptable? Dashed line shows ventilation rate that led to 20% dissatisfaction. Data from Cain et al. (1983).

Figure 2. Frequency distribution of ventilation rates recommended for various types of spaces (e.g., offices, auditoriums, ticket booths, waiting rooms) by the ASHRAE standard on ventilation and indoor air quality.

Figure 3. Showing the intensity of ETS odor perceived by visitors to the sampling box during and after intermittent (4 cig/hr) or continuous (8 and 16 cig/hr) smoking in the climate chamber. Results are expressed relative to level of butanol matched to odor during presmoking occupancy. The open squares in the left panel show a function for nonsmoking occupancy for comparison. Ventilation rate per occupant under smoking conditions refers to smokers, who were the only occupants in the chamber. From Cain et al. (1983).

Figure 4. Percent dissatisfaction among visitors vs ventilation during the last 15 min of smoking in the experiment shown in Fig. 3. Ventilation rate per cigarette based on 7.5-min smoking time per cigarette. Ventilation rate per occupant adjusted to conditions of smoking occupancy that assumed 10% of occupants will be smoking at any give time. Modified from Cain et al. (1983).

Figure 5. Percent dissatisfaction vs odor intensity (graphic rating) for occupancy odor and for ETS odor. Data from Cain et al. (1983).

Figure 6. Left: Percent dissatisfaction vs odor intensity (matched level of butanol) judged by smokers and nonsmokers. Right: Percent dissatisfaction vs increment in concentration of airborne carbon monoxide. Modified from Clausen (1986).

Figure 7. Perceived magnitude of eye irritation and degree of dissatisfaction expressed by occupants exposed to ETS for an hour. Concentrations of carbon monoxide were held constant throughout the exposures and indicate severity of exposure. Filtration refers to elimination of particles via

electrostatic precipitation. ^{Draft - Do not cite or quote} Filtration had little effect on
irritation. From Cain et al. (1987).

Draft - Do not cite or quote

TABLES AND FIGURES FOR CHAPTER 8

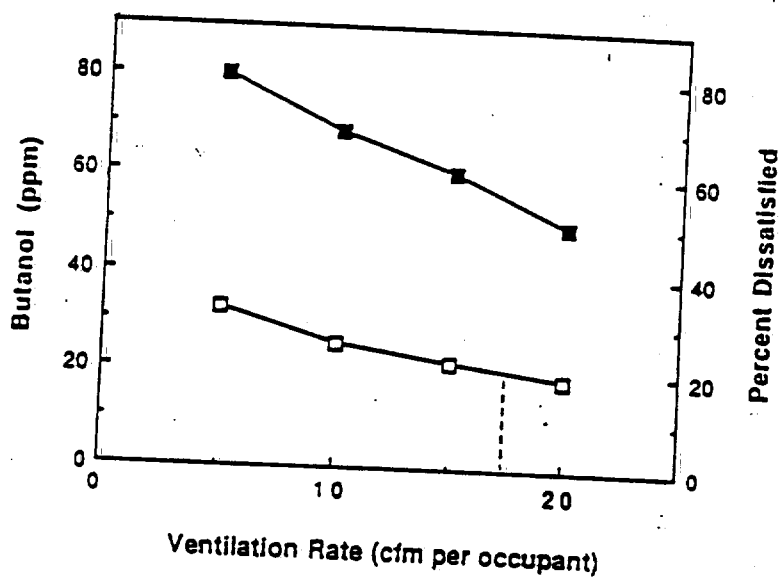


Figure 1

2023496550

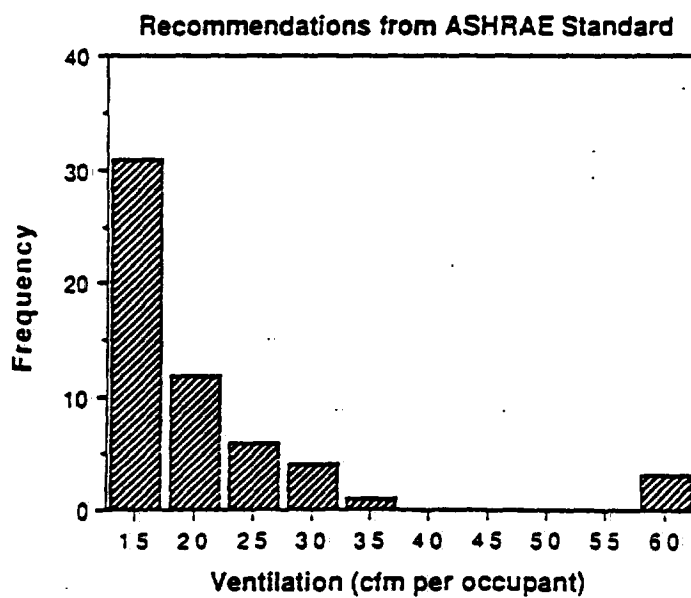
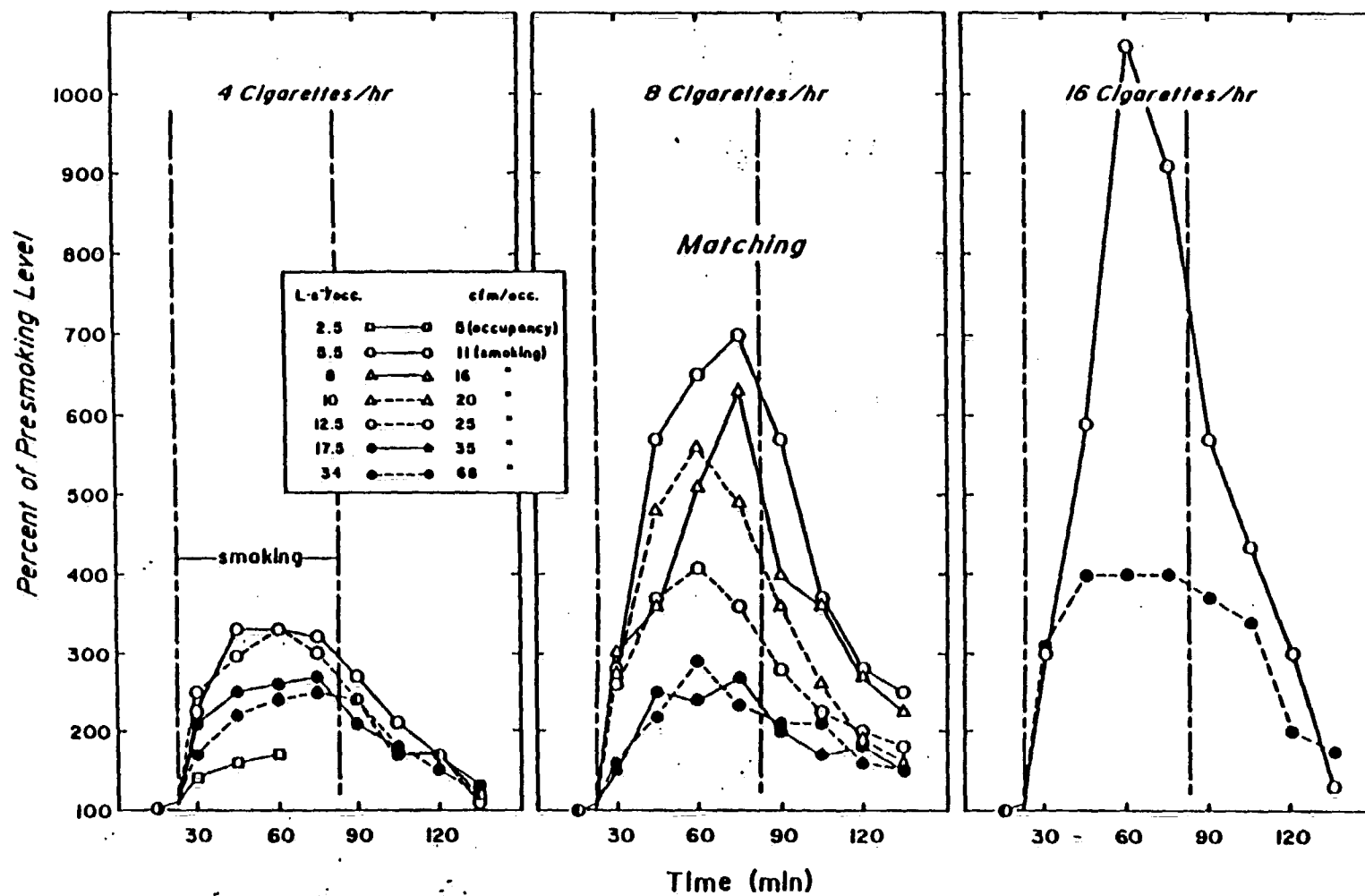


Figure 2

2023496551

Figure 3



Draft - Do not cite or quote

2023496552

Draft - Do not cite or quote

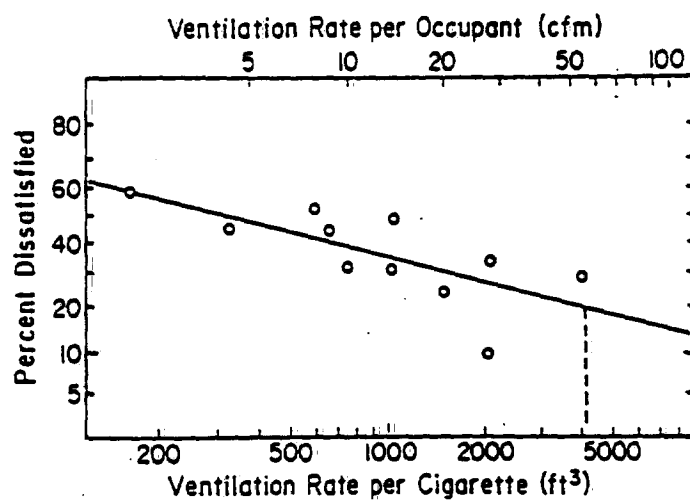


Figure 4

2023496553

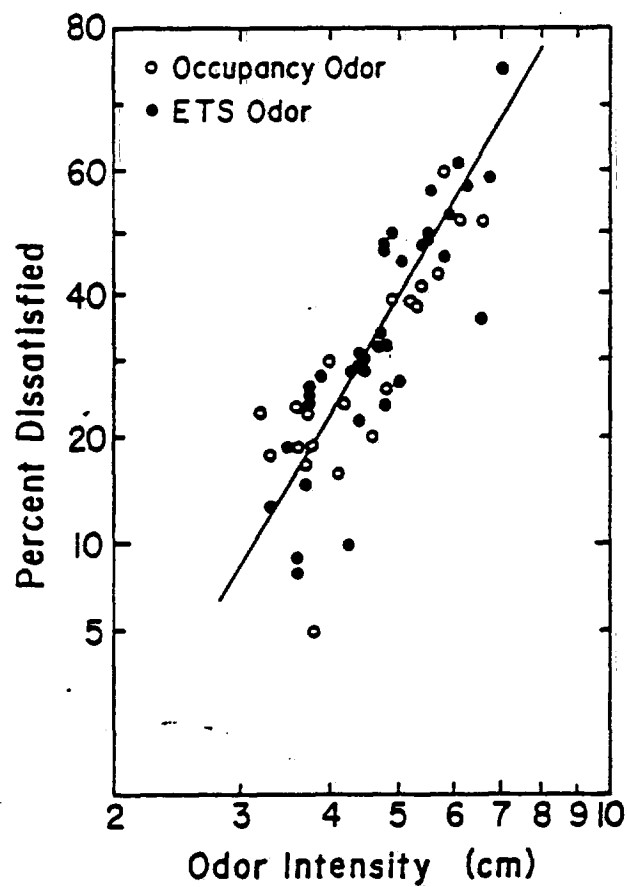


Figure 5

2023496554

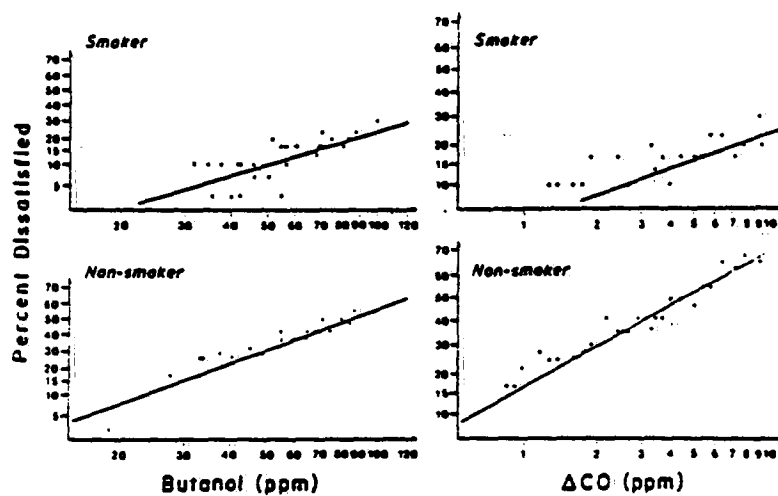


Fig 6

2023496555

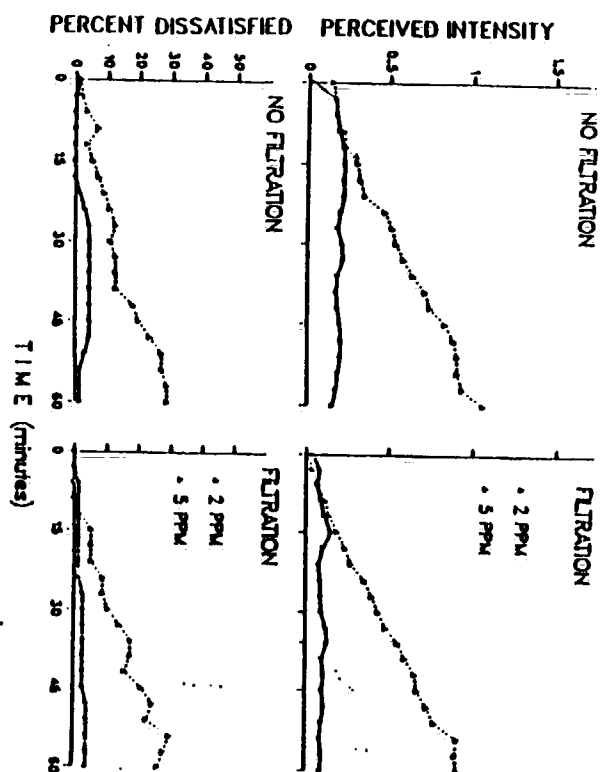


Fig. 7

2023496556

CHAPTER 9

PASSIVE SMOKING--BELIEFS, ATTITUDES, AND EXPOSURES IN THE UNITED STATES

Thomas E. Novotny, M.D.

Office on Smoking and Health
Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control

Introduction

The relationship among public attitudes, policies, and exposure to certain health hazards is complex. With the release of the 18th Surgeon General's report on smoking and health, The Health Consequences of Involuntary Smoking (PHS 1986), public attention on the issue of environmental tobacco smoke (ETS) was more strongly focused than ever before. For many years, however, pollsters, the tobacco industry, and the health promotion community have been surveying the public concerning attitudes toward ETS and toward restrictions on smoking in public places. The Surgeon General's Report described data from several of those surveys as well as results from evaluations of worksite and local policy changes. Additional detailed data on public beliefs and attitudes toward smoking in general are found in the 1989 Surgeon General's Report: Reducing the Health Consequences of Smoking -- 25 years of Progress (PHS 1989). Recently, surveys have also included questions on beliefs about the harmfulness of ETS to the nonsmoker and on respondents' reported exposure to ETS. In addition to such measures of individual exposure to ETS, surveys of worksites and of personnel managers have provided information about restrictions on smoking in the workplace. Because changes in public attitudes toward ETS usually precede laws or policies regarding ETS exposure (PHS 1986), examining trends in these data over time is useful. This chapter will summarize the most important findings from several different nationally based data sources. Some of this information was included in the 1989 Report of the Surgeon General (PHS 1989).

Data Sources and Methodology

Several surveys of public beliefs, attitudes, and reported exposures to ETS are available (Table 1). Although these surveys may report discrepant results, most discrepancies can be explained by the differences in methodology, especially in the ways questions are worded. To describe the effect of increasing numbers and strength of laws and policies against smoking in public places,

Draft - Do not cite or quote

national surveys of worksites were also carried out in the 1980s (PHS 1986). These surveys indicate the degree to which workers may be protected from ETS exposure. The 1987 National Health Interview Survey of Cancer Epidemiology and Control also collected information about respondents' actions in response to ETS exposure.

Tobacco Industry Surveys

1. Roper Surveys: The Roper Organization conducted six biennial national opinion surveys for The Tobacco Institute between 1966 and 1978. The 1974, 1976, and 1978 surveys focused on the passive smoking/nonsmoker's rights issue (Roper 1978), whereas all six surveys dealt with public attitudes toward the smoking and health issue in general, toward the tobacco industry itself, and toward government regulation of tobacco. The surveys were cross-sectional, population-based telephone interviews. The sample included over 2,000 adults, aged 17 years or older; other information about the exact methodology and response rates is unavailable. The 1974-1978 Roper surveys permit comparisons of data collected for the tobacco industry with similar data collected in the 1970s by the Office on Smoking and Health (OSH, formerly known as the National Clearinghouse for Smoking and Health).

2. Hamilton, Frederick, and Schneiders: In December 1988, the Tobacco Institute sponsored a telephone-based national adult survey of 1,500 adults (401 smokers and 1,099 nonsmokers) which was conducted by Hamilton, Frederick, and Schneiders (Hamilton, Frederick and Schneiders, 1989). This survey asked about various public policy issues and was designed to measure levels of support for governmental policy on smoking. The respondents were asked what they thought about restrictions on smoking in restaurants and worksites. Neither the response rates nor the results by smoking status of the respondents were reported.

Other Public Opinion Surveys

1. Gallup Surveys: The Gallup Organization has published Gallup Poll results monthly since 1965. Surveys are either personal interviews or by telephone and have a population-based sample of at least 1000 adults, aged 18 years or older. The sampling error for overall responses is reported to be no more than $\pm 3\%$ (Gallup Report 1987). In addition, Gallup surveys may be commissioned by a variety of organizations. The surveys reported here were commissioned by the American Lung Association (1983, 1985, 1987, and 1989) and the American Cancer Society (1988) to describe both the prevalence of smoking and public opinions regarding smoking issues. An additional Gallup Survey was commissioned by the National Restaurant Association (1987) to obtain public opinion on smoking in restaurants. The 1989 Gallup Survey sponsored by the American Lung Association did not ask respondents about their smoking status.

2. Harris Poll: Louis Harris and Associates have performed eight national surveys covering smoking between 1974 and 1987 using probability samples of adults aged 18 years and older. These surveys were conducted on behalf of various organizations, including Prevention magazine and Pacific Mutual Life Insurance Co., to ascertain health practices of Americans. In 1987, 1,250 persons were also asked about regulating smoking in public places.

Government Sponsored Surveys

1. Adult Use of Tobacco Surveys (AUTS): The Office on Smoking and Health commissioned surveys of adult smoking behavior, attitudes, and beliefs in 1964, 1966, 1970, 1975, and 1986. These surveys oversampled persons who had ever smoked, but final results were weighted to represent the United States resident population aged 21 years and older (1964, 1966, 1970, 1975). The 1986 AUTS oversampled ever smokers but collected data from persons aged 17 and older. The final data in this survey (overall response rate, 74.3%) were weighted to reflect the educational, regional, racial, and age distribution of the U.S. population on the basis of the 1986 Current Population Survey of the U.S. Bureau of the Census. The 1986 AUTS collected detailed information on attitudes, beliefs, and exposure regarding ETS.

2. National Health Interview Survey: The National Health Interview Survey of Cancer Epidemiology and Control (NHIS-CEC) collected data in-person from 22,000 adults aged 18 years and older in households throughout the United States. The data were weighted to reflect the adult U.S. population, and the overall response rate for NHIS-CEC was 82%. Respondents were asked about the harmfulness of ETS and about attitudes toward passive smoking. Questions included items on perceived annoyance and whether smoking should occur inside public places. Nonsmokers were asked how they would act in response to smokers' lighting up in their presence.

Other Surveys

1. Bureau of National Affairs: The Bureau of National Affairs (BNA) and the American Society for Personnel Administration (ASPA) conducted a mail-in questionnaire survey of ASPA members, and 623 respondents reported on activities related to smoking in the workplace. The response rate was 54%. A similar survey was carried out by the BNA in 1986 on 662 businesses.

2. Office of Disease Prevention and Health Promotion: In 1988, the Office of Disease Prevention and Health Promotion (ODPHP) of the United States Public Health Service reported on worksite health promotion activities, including smoking control. The survey, carried out in 1985 on a sample drawn from the Dun and Bradstreet

list of businesses, used telephone interviewing. To develop a probability sample based on geographic region, size of firm, and industry type, 320 worksites with 50-90 employees and 1,038 worksites with 100 or more employees were surveyed. Questions about smoking restrictions were included.

3. American Board of Family Practice: In December 1984, the American Board of Family Practice (ABFP) sponsored a national telephone survey conducted by Research and Forecasts, Inc., of 1,007 adults aged 18 years and older and of 303 family physicians. Questions were asked regarding beliefs about the harmfulness of ETS, the rights of smokers and nonsmokers, and whether smoking restrictions are effective in stopping or discouraging smoking. The final sample response rates were 41% for the general public and 37% for physicians. Data for the general public portion of this survey were weighted to reflect the estimated 1985 U.S. population. The physicians surveyed represented a random sample of U.S. family physicians. The results were published in a report entitled, Rights and Responsibilities: Healthcare Options (ABFP 1985).

Results of Surveys

1. Perceived Harmfulness of Environmental Tobacco Smoke

The Roper Surveys asked questions regarding harm and annoyance caused by ETS. All AUT surveys asked about annoyance caused by ETS, but only the 1986 AUTS asked if respondents believed that ETS is harmful to the nonsmoker. The 1983 and 1988 Gallup Surveys asked if respondents believed that smoking is hazardous to the health of nonsmokers. The 1978 Roper Survey, the 1986 AUTS, and the 1988 Gallup survey provide interesting information on the change over the last several years in public beliefs about the harmfulness of ETS to nonsmokers. The 1985 ABFP Survey asked both adults and physicians if they believed nonsmokers are harmed by breathing in the smoke of others in the same room.

Questions regarding harm caused by ETS showed that between 1974 and 1986, the percentage of smokers who believed that ETS is harmful to the health of the nonsmoker more than doubled (Table 2). In 1974, most nonsmokers believed that ETS is harmful to health in general, and the percentage of those who held this belief increased substantially over time. In answering an additional question on the 1986 AUTS, 69% of nonsmokers felt that ETS is harmful to their own personal health. The results of the 1989 Gallup poll suggest that there is even stronger belief by respondents (smokers and nonsmokers) in the harm of ETS to pregnant women and children. These data show that there has been a major change in the perception of ETS as a health hazard over the last decade.

2. Annovance Caused by Environmental Tobacco Smoke

The AUT surveys show an increasing trend in the percentage of respondents who are annoyed by ETS (Table 3a). Data regarding annoyance to ETS from Roper Surveys other than the 1978 survey are not available. However, the results of both the 1978 Roper Survey and the AUTS suggest that increasing numbers of Americans are annoyed by ETS exposure.

The results of the 1987 NHIS-CEC also indicate increased annoyance from ETS. In this survey, a smaller percentage of current smokers reported annoyance than on the 1986 AUTS, but this difference may be due to different methodologies. The NHIS-CEC also collected information about what nonsmokers did in response to exposure to ETS (Table 3b). About half of respondents moved away from the exposure source, 40% did nothing, 3% did something else, and only 4% asked the person not to smoke. Despite their high positive responses to perceived harm caused by ETS and annoyance from ETS, most nonsmokers remain rather passive in their behavior toward smokers (Davis et al., 1990).

3. Limiting or Banning Smoking in Public Places

The majority of respondents to the 1978 Roper Survey felt that smokers should at least be segregated in all the public places cited (Table 4). After being asked about segregation of smokers and nonsmokers, respondents were then asked if smoking should be banned outright in selected public places. The majority of respondents favored smoking bans in retail stores, physicians' or dentists' waiting rooms, and elevators (Table 5a). The narrative description of the survey results pointed out that after recognizing the option to segregate smokers, respondents were probably less likely to be in favor of a total ban (Roper 1978).

The two most important reasons given by Roper Survey respondents before 1978 as to why smoking should be restricted had to do with dangers to others, specifically, cigarette smoking as a fire hazard and ETS as a health hazard to nonsmokers. In 1978, the chief reason respondents gave in favor of public laws against smoking was that the "health of nonsmokers is harmed by other people smoking in their presence."

- In 1983, 1985, 1987, and 1989, the Gallup Organization conducted telephone surveys for the American Lung Association (ALA) that asked if smokers should refrain from smoking in the presence of nonsmokers. Overall, the percentage of respondents to these surveys who agree that smokers should not smoke in the presence of nonsmokers has increased from 69% in 1983 to 82% in 1989 (Table 6a). This trend holds true for both smokers and nonsmokers. Unfortunately, the 1989 survey did not differentiate between smokers and nonsmokers.

The ALA Gallup Surveys also included questions on where smoking should be restricted or banned. With regard to smoking in hotels, motels, and restaurants, the majority of respondents in 1983, 1987, and 1989 felt that certain areas should be set aside for smoking (Table 7). Complete bans were less favored, especially by persons who currently smoked.

In addition, respondents to the ALA Gallup Surveys were asked in 1983, 1985, and 1987 if companies should have a policy on smoking at work. By 1985, almost 90% of all respondents, including 80% of smokers and 89% of nonsmokers, felt that smoking should be assigned to certain areas of the worksite or that it should be totally banned at work (Table 7).

In 1987, the monthly Gallup Polls (not commissioned by the ALA) asked if respondents favored or opposed a complete ban on smoking in all public places. The results of these polls are much more strongly in favor of total bans on smoking in public places. These results contrast sharply with the Roper results of almost a decade ago and are even more in favor of increased restrictions on smoking in public places than the ALA-sponsored surveys in the same year.

In the Gallup Survey conducted for the National Restaurant Association in 1987, 61% of adults reported that they preferred no-smoking sections in restaurants. These included 20% of smokers, 65% of former smokers, and 83% of never smokers (Gallup 1987). These results are similar to those of the AUTS on preferences concerning no-smoking sections described later in this chapter.

The 1987 NHIS-CEC asked a slightly different question than either the Gallup Surveys or the AUTS. This question restricted the respondent to consider indoor public places. The percentage of all respondents, especially former smokers, agreeing that smoking should not be allowed inside public places, was higher on this survey than on the 1987 Gallup survey (Table 6b). The Gallup question applied to a general statement about refraining from smoking in the presence of nonsmokers.

Interestingly, the Tobacco Institute-sponsored survey by Hamilton, Frederick, and Schneiders in 1988 showed even stronger preferences for restaurant and worksite restrictions than the ALA surveys mentioned previously (Table 5b). For each of these sites, the question referred to the "current policy" as a response choice; for restaurants, the "current policy" meant that customers must select smoking vs. nonsmoking sections; for worksites, employers and employees should decide on worksite restrictive policies. In this survey, 2% of respondents favored no restrictions on smoking in restaurants compared with 8% in the ALA survey, and 3% favored no restrictions on smoking in worksites compared with 10% in the ALA survey.

Between 1964 and 1975, the percentage of respondents to the AUT

surveys who favored restrictions on smoking in public places increased from 52% to 70% (strongly agree and mildly agree) (Table 8). However, the question asked in 1986 was quite different from the questions asked in the earlier surveys (Table 3). Between 1964 and 1975, AUTS respondents who favored more restrictions increased by 18 percentage points. About half of respondents in 1986 felt that restrictions against smoking were adequate, perhaps because many more restrictions were in place by 1986.

In 1966 and 1975, respondents were also asked if employers have a right to regulate smoking in their places of business. In 1966, 92% felt that the "employer has a right to tell a person when or where he can smoke while on the job," whereas in 1975, 78% felt that "management should have the right to prohibit smoking in their places of business." These are very different questions: the first concerns management's right to regulate employees, and the second concerns management's right to regulate customers, visitors, and employees.

In 1987, respondents to the Harris Poll that was performed for Prevention magazine were asked if laws should prohibit smoking in public places or require separate smoking and nonsmoking sections, or should smoking in public places not be regulated by law. Among all respondents, 23% felt that laws should prohibit smoking in public places, 61% felt that laws should require separate smoking and nonsmoking sections, and only 13% felt that laws should not regulate smoking in public places at all (3% were unsure). Again, more than 80% of respondents, smokers and nonsmokers, favored restrictions against smoking in public places.

4. Public Opinion on Restrictions After Enactment of Laws

Few evaluations of the acceptability of laws banning smoking in public places have been performed. New York City enacted a ban on smoking in most public places, including restaurants, in April 1988. Three months after the ban took effect, a telephone poll of 676 randomly sampled New Yorkers (New York Times/WCBS-TV poll) revealed that 73% of respondents approved of the law, including 84% of nonsmokers and 43% of smokers (New York Times, July 5, 1988).

The 1986 AUTS asked respondents if they would select nonsmoking sections in airplanes, restaurants, and other public places if given a choice. Overall, 61% choose nonsmoking seating, including 82% of never smokers, 69% of former smokers, and even 14% of current smokers (CDC 1988).

Finally, a clean-indoor-air ordinance that took effect in March 1987 in Cambridge, Massachusetts was evaluated by researchers at Harvard University after three months of implementation. This evaluation study revealed that 78% of Cambridge residents favored

the restriction, including 41% of smokers and 90% of nonsmokers (Rigotti 1988).

5. Exposure to ETS

Many studies have demonstrated the biochemically measurable exposure of nonsmokers to ETS (PHS 1986). However, only the 1986 AUTS has asked a nationally representative sample of residents about exposure to ETS. A subsample of 8,600 working respondents from the AUTS was analyzed with respect to reported exposure at the worksite and reported policies restricting smoking at their worksites (Table 9). Fifty-three percent of respondents who worked in environments with restrictive smoking policies still reported exposure to ETS. Of these, 11% reported that their worksite is "very smoky." Even among the 2.5% of respondents reporting a total ban on smoking in the workplace, 21% reported still being at least somewhat exposed to ETS at work. These data help confirm the notion that worksite restrictions decrease but do not eliminate reported exposure to ETS at the worksite.

6. The Increasing Number of Policies/Laws Restricting Smoking at the Worksite

In 1987, 54% of respondents to the BNA/ASPA survey reported that their worksites had restrictive smoking policies, up from 36% in 1986 (BNA 1987). The 1986 figure was nearly the same as the percentage of individual workers reporting the presence of such policies in the 1986 AUTS.

Among respondents to the 1985 ODPHP Worksite Survey, 35.6% of worksites reported offering smoking control activities, including classes, information, special events, or contests. Of those companies, 76.5% also had formal smoking policies (restriction or prohibition). In addition to frequently cited benefits--such as improved employee morale, improved employee health--respondents reported cleaner air and work environments, fewer smokers in the workforce, and fewer complaints from nonsmokers (PHS 1988).

7. Perceived Future Effect of Restrictive Smoking Policies

The National Survey of Healthcare Opinions sponsored by the ABFP and carried out by Research and Forecasts, Inc., in 1985 asked adults and family physicians if restrictions on smoking in medical facilities or on the job would be effective in stopping or discouraging smoking. Among the nonphysicians, 57% felt that restrictions in medical facilities would be effective, and 40% felt that restrictions by employers against smoking on the job would be effective. Among physicians, 83% felt that such restrictions would be effective in health care facilities, and 67% felt that restrictions would be effective on the job. These responses should be differentiated from those in other surveys that ask about support for restrictive smoking policies. The ABFP survey tried

to ascertain if respondents thought policies were an effective intervention for smokers to refrain from using tobacco, whereas the Gallup surveys tried to ascertain what people want in terms of protecting the nonsmoker from exposure to ETS.

Few studies have actually been able to assess the effect of restrictive smoking policies on smokers' behavior, but some studies from individual worksites show decreased numbers of cigarettes smoked per day without a change in the prevalence of smoking (Peterson et al., 1987, Rosenstock et al., 1986).

Conclusions

These data indicate an important shift in public beliefs and attitudes toward ETS over the last decade or more. The majority of U.S. citizens have recognized that cigarette smoking directly harms the health of smokers (89% of men and 90.9% of women in 1975 [AUTS 1975]; 92% of men and 91.8% of women in 1986 [AUTS 1986]). Moreover, the percentage of survey respondents who believe that ETS also harms the health of nonsmokers has increased dramatically (46% overall in 1974 [Roper 1978] to 81% overall in 1986 [AUTS 1986, Gallup 1988]). Even more Americans agree that ETS harms vulnerable populations such as pregnant women and children.

Many laws and local ordinances that were put into place during the last decade undoubtedly increased public awareness of ETS issues (PHS 1989). The National Academy of Sciences Report and the Surgeon General's Report on involuntary smoking were released in late 1986. However, not all of the change in belief about harmfulness to ETS can be attributed to the publication of these reports, even though they received enormous media attention; most of the 1986 AUTS had been completed by late 1986. Therefore, the increase in reported beliefs about the harmfulness of ETS likely reflects a growing and sustained awareness among U.S. residents rather than merely a public response to the highly visible Surgeon General's Report. This report may have convinced more persons about the harmful effects of ETS, as evidenced by the results of the 1989 Gallup Survey.

The slightly discrepant results on attitudes toward laws regarding restricting smoking in public places found in the 1986 AUTS and the 1988 Harris Poll may be explained by the differences in the way the question was asked in this survey. Many laws were put into place by 1986, and respondents may have felt less concerned about increasing regulations than they did in earlier surveys, before these laws were in effect. These laws have been evaluated directly by researchers in some jurisdictions and indirectly by surveys, and they are apparently widely accepted by both smokers and nonsmokers.

There appears to be a trend towards limiting smoking in workplaces. It is unclear whether laws and regulations restricting smoking in

public places (which became widespread in the late 1970s) were the stimuli for policies restricting smoking in the workplace (which are mostly a phenomenon of the 1980s) or whether simply the concern for the health of nonsmokers is the stimulus for this trend. The 1986 AUTS results, which show that even with a total ban on smoking in the workplace some workers are exposed to ETS, suggest that there is incomplete enforcement of restrictions. In worksites where smokers and nonsmokers are segregated, exposure to ETS may result from the inefficiency of separating smokers and nonsmokers within the same airspace. The 1986 Surgeon General's Report concluded that this level of restriction was inadequate to protect the nonsmoker from ETS (PHS 1986). The 1990 Health Objectives for the Nation, which were endorsed by the U.S. Public Health Service, recommend that all 50 states have laws by 1990 that both prohibit smoking in enclosed public places and require separate smoking areas in the workplace and in dining establishments (PHS 1980). The number and strength of these "clean indoor air" laws continues to increase at both the state and local level. (PHS, 1989)

As of late 1988, 31 states had laws restricting smoking in public worksites, 13 had laws restricting smoking in private worksites, and 26 had laws restricting smoking in restaurants (PHS 1989).

Continuing to assess public knowledge and beliefs regarding tobacco use remains important as new information becomes available. These survey results assist public health providers in measuring the success of policies to control health hazards such as ETS. In addition, these data emphasize the change in the social milieu surrounding tobacco use. The shift in public attitudes away from the social acceptability of smoking may increase the pressure for smokers to quit and for potential smokers to avoid smoking. Policy-makers may also find it easier to address tobacco issues more directly if they understand the public opinions expressed through these surveys.

SUMMARY

1. The majority (81%) of U.S. citizens have recognized that cigarette smoking harms the health of nonsmokers.
2. As of late 1988, 31 states had laws restricting smoking in public worksites, 13 had laws restricting smoking in private worksites, and 26 had laws restricting smoking in restaurants.
3. There appears to be a trend towards limiting smoking in workplaces; however, there are indications of incomplete enforcement of restrictions.

References

Bureau of National Affairs. Where there's smoke: problems and policies concerning smoking in the workplace. A BNA special report 2nd ed. Rockville, Maryland: Bureau of National Affairs, 1987.

CDC. Cigarette smoking in the United States, 1986. MMWR 1987;36(35):581-585.

CDC. Passive smoking: Beliefs, attitudes, and exposures--United States, 1986. MMWR 1988;37(15):239-241.

Davis RM, Boyd GM, Schoenborn CA. 'Common Couresty' and the elimination of passive smoking. Results of the 1987 National Health Interview Survey. JAMA 1990; 263: 2208-2210.

Gallup. Survey of attitudes toward smoking. Conducted for the American Lung Association. Princeton, New Jersey: Gallup Organization, July 1985.

Gallup. Attitudes toward smoking in restaurants and fast food establishments. Conducted for the National Restaurant Association. Princeton, New Jersey: Gallup Organization, February 1987.

Gallup. Majority backs ban on smoking in public places. Gallup Report No. 258. Princeton, New Jersey: Gallup Organization, March 1987.

Gallup. On-the-go Americans prefer smoke-free air. Am J Pub Health 1988;78(5):563.

Gallup. A telephone survey of 1549 adults conducted in 1988 for the American Cancer Society. The Gallup Report 1988, No. 268. Princeton, New Jersey: Gallup Organization, September 1988.

Gallup. Survey of attitudes toward smoking. Conducted for the American Lung Association. Princeton, New Jersey: Gallup Organization, August 1989.

Harris, Louis and Associates. Prevention in America V: steps people take or fail to take for better health, 1987. Survey performed for Prevention Magazine. May 13, 1988. Appendix B:page 8.

Hamilton, Frederick, and Schneiders. National Survey of American's Attitudes on Various Public Policies and Practices. Conducted for The Tobacco Institute, December 1988.

National Center for Health Statistics. Smoking and other tobacco use: United States, 1987. Hyattsville, Maryland: National Center for Health Statistics. DHHS Pub. No. 89-1597. NCHS Series 10, # 169.

National Clearinghouse for Smoking and Health. Adult use of tobacco 1970. Rockville, Maryland: US Department of Health, Education, and Welfare. Public Health Service. June 1973.

National Clearinghouse for Smoking and Health. Adult use of tobacco 1975. Rockville, Maryland: US Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control, June 1977.

National Clearinghouse for Smoking and Health. Use of tobacco: practices, attitudes, knowledge, and beliefs, United States--Fall 1964 and Spring 1966. Washington D.C.: U.S. Department of Health, Education, and Welfare. Public Health Service July 1969.

Office of Health Promotion and Disease Prevention. National Survey of Worksite Health Promotion Activities. Washington, D.C.: U.S. Department of Health and Human Services. Public Health Service. Summer 1987.

Peterson LR, Helgerson SD, Gibbons CM, Calhoun CR, Ciacco KH, and Pitchford KC. Employees smoking behavior changes and attitudes following a restrictive policy on worksite smoking in a large company. Public Health Rep 1988;103(2):115-120.

Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, D.C.: US Department of Health and Human Services, Public Health Service, 1980.

Public Health Service. The health consequences of involuntary smoking: a report of the Surgeon General. Rockville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1986; DHHS publication no. (CDC) 87-8398.

Public Health Service. Reducing the Health Consequences of Smoking--25 Years of Progress. A Report of the Surgeon General. Rockville, Maryland: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1989; DHHS publication no. (CDC) 89-8411.

Public Health Service. Major local smoking ordinances in the United States. A detailed matrix of the provisions of workplace, restaurant, and public places smoking ordinances. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, 1989. DHHS Publ. # (NIH) 90-479.

Research and Forecasts, Inc. Rights and responsibilities -- a national survey of health care opinions sponsored by the American Board of Family Practice. Lexington, Kentucky: American Board of Family Practice, 1985.

Rigotti NA, Stoto MA, Kleiman M, Schelling TC. Implementation and impact of a Cambridge, Massachusetts, ordinance restricting smoking in public places and the workplace. In Aoki et al., eds. Smoking and Health 1987. Proceedings of the 6th World Conference on Smoking and Health, Tokyo, 9-12 November 1987. Amsterdam: Excerpta Medica, 1988.

Roper Organization. A study of public attitudes toward cigarette smoking and the tobacco industry in 1978. New York: Roper Organization, May 1978.

Rosenstock IM, Stergachis A, Heaney C. Evaluation of smoking prohibition policy in a health maintenance organization. Am J Public Health 1986;76(8):1014-1015.

Anonymous. Support for smoking ban. New York Times, July 5, 1988:B2.

Draft - Do not cite or quote

FIGURES AND TABLES FOR CHAPTER 9

Table 1. Surveys With Information on Beliefs, Attitudes,
and Exposures to Environmental Tobacco Smoke

| <u>Survey</u> | <u>Year</u> | <u>Sponsor</u> |
|----------------------------------|-------------------------|---------------------------------------|
| Adult Use of Tobacco | '64, '66, '70, '75, '86 | Office on Smoking and Health |
| Roper Organization | '74, '76, '78 | Tobacco Institute |
| Gallup Survey | '83, '85, '87, '89 | American Lung Association |
| Research & Forecasts | '85 | American Academy of Family Physicians |
| Gallup Survey | '87 | National Restaurant Association |
| Harris Poll | '87 | Prevention Magazine |
| Gallup Survey | '88 | American Cancer Society |
| Hamilton, Frederick & Schneiders | '88 | Tobacco Institute |

Draft - Do not cite or quote

Table 2. Beliefs About Harmfulness of Environmental Tobacco Smoke to Nnonsmokers (% of Respondents) by Smoking Status

| <u>Smoking Status</u> | | | | | | |
|---------------------------|-------------|----------------|----------------|-------------------|-----------------|--------------------|
| <u>Survey</u> | <u>Year</u> | <u>Current</u> | <u>Former</u> | <u>Nonsmokers</u> | <u>Never</u> | <u>All</u> |
| | | <u>Smokers</u> | <u>Smokers</u> | | <u>Smokers</u> | <u>Respondents</u> |
| Roper | '74 | 30 | | 57 | | 46 |
| Roper | '76 | 38 | | 61 | | 52 |
| Roper | '78 | 40 | | 69 | | 58 |
| Gallup | '83 | 64 | 80 | | 84 | |
| Research | | | | | | |
| Forecasts | '85 | | | | | 77 |
| | | | | | (Physicians=87) | |
| AUTS | '86 | 69 | 82 | 85 | 87 | 81 |
| NHIS-CEC | '87 | 67 | 84 | 89 | | 82 |
| Gallup | '88 | 64 | 86 | 89 | | 81 |
| Gallup | '89 | | | | | |
| Harmful to adults | | | | | | 86 |
| Harmful to pregnant women | | | | | | 88 |
| Harmful to children | | | | | | 89 |

Source: Roper Organization 1978; Gallup Surveys 1983, 1988; Adult Use of Tobacco Survey 1986, Research and Forecasts 1985

Table 3a. Annoyance Caused by
Environmental Tobacco Smoke
(% of Respondents Reporting Annoyance)
by Smoking Status

Annoyed by ETS

| <u>Survey</u> | <u>Smoking Status</u> | | | | |
|---------------|----------------------------|---------------------------|-------------------|--------------------------|----------------------------|
| | <u>Current Smokers</u> | <u>Former Smokers</u> | <u>Nonsmokers</u> | <u>Never Smokers</u> | <u>All Respondents</u> |
| AUTS 1964 | 20 | 49 | 64 | 69 | 46 |
| AUTS 1966 | 26 | 52 | | 70 | 48 |
| AUTS 1970 | 34 | 63 | 73 | 78 | 59 |
| AUTS 1975 | 35 | 72 | 79 | 79 | 63 |
| ROPER 1978 | 5 | | | 60 | |
| AUTS 1986 | 42 | 73 | 80 | 83 | 69 |
| NHIS-CEC 1987 | 34 | 75 | 88 | 69 | |

Source: Adult Use of Tobacco Surveys 1964, 1966, 1970, 1975, 1986;
Roper Organization 1978, NHIS-CEC 1987.

Draft - Do not cite or quote

Table 3b. Reactions to Secondhand Smoke in Public Places, 1987*

| | <u>Former</u> <u>Smokers</u> <u>$\frac{1}{2}$</u> | <u>Never</u> <u>Smokers</u> <u>$\frac{1}{2}$</u> | <u>All</u> <u>Nonsmokers</u> <u>$\frac{1}{2}$</u> |
|-------------------------|--|---|--|
| Ask person not to smoke | 4 | 5 | 4 |
| Move away | 52 | 46 | 52 |
| Do nothing | 40 | 47 | 40 |
| Do something else | 3 | 3 | 3 |

*Not asked of current smokers

Source: 1987 NHIS-CEC (Davis et al.; 1990)

Table 4. Public Opinion (% of Respondents Who Agree)
on Separating Smokers and Nonsmokers
in Selected Public Places, 1978

Smoking should be permitted:

| | <u>In separate sections</u> % | <u>Anywhere</u> % |
|---------------------------------|--------------------------------------|----------------------|
| In trains, airplanes, and buses | 91 | 7 |
| In theaters | 83 | 11 |
| In eating places | 73 | 25 |
| At indoor sporting events | 73 | 22 |
| At public meetings | 67 | 28 |
| In train, plane, bus stations | 62 | 34 |
| In work places or offices | 61 | 34 |
| In barber or beauty shops | 53 | 42 |

Source: Roper Organization 1978

Draft - Do not cite or quote

Table 5a. Public Opinion (% of Respondents Agreeing)
on Banning Smoking in Selected Public Places, 1978

| | <u>Should smoking be:</u> | |
|--|---------------------------|-------------------|
| | <u>Banned</u> | <u>Not banned</u> |
| | <u>%</u> | <u>%</u> |
| In elevators | 86 | 12 |
| In doctors' or dentists' waiting rooms | 69 | 27 |
| In retail stores | 55 | 41 |
| In theaters | 44 | 47 |
| At indoor sporting events | 34 | 57 |
| At public meetings | 32 | 58 |
| In city, state, or federal buildings | 32 | 63 |
| In taxis | 32 | 64 |
| In trains, planes, buses | 26 | 65 |
| In eating places | 23 | 68 |
| In barber or beauty shops | 21 | 70 |
| In work places or offices | 17 | 73 |
| In train, plane, bus stations | 16 | 75 |

Source: Roper Organization 1978

Table 5b. Public Opinion (% of Respondents Agreeing)
on Prohibiting Smoking or Retaining Current Policies
in Selected Public Places, 1988

| | <u>"Current Policy"</u> | <u>Prohibit all Smoking</u> | <u>No Restriction</u> |
|----------------|-------------------------|-----------------------------|-----------------------|
| In Restaurants | 74 | 24 | 2 |
| In Worksites | 76 | 20 | 3 |

Source: Hamilton, Frederick, and Schneiders 1988

Table 6a. Should Smokers Refrain from Smoking
in the Presence of Nonsmokers? (% of Respondents)
by Cigarette Smoking Status, 1983, 1985, 1987, and 1989

| | <u>Agree</u> | | | | <u>Disagree</u> | | | | <u>Don't Know</u> | | | |
|-----------------------|--------------|------------|------------|------------|-----------------|------------|------------|------------|-------------------|------------|------------|------------|
| <u>Survey Year:</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> |
| <u>Smoking Status</u> | | | | | | | | | | | | |
| Current Smokers | 55 | 62 | 64 | | 39 | 37 | 31 | | 6 | 1 | 5 | |
| Former Smokers | 70 | 78 | 76 | | 22 | 22 | 19 | | 8 | 0 | 5 | |
| Nonsmokers | 82 | 85 | 86 | | 14 | 15 | 10 | | 4 | * | 4 | |
| All Respondents | 69 | 75 | 77 | 82 | 25 | 24 | 19 | 15 | 6 | 1 | 4 | 2 |

*Less than 0.5%

Source: Gallup Surveys 1983, 1985, 1987, 1989

Table 6b. "If People Want to Smoke, They Should Not Do So
Inside Public Places Where it Might Disturb Others"
(% of Respondents Agreeing) 1987

| | <u>Agree</u> | <u>Disagree</u> | <u>No Opinion</u> |
|-----------------|--------------|-----------------|-------------------|
| Current smokers | 67 | 22 | 9 |
| Former smokers | 80 | 10 | 8 |
| Never smokers | 89 | 5 | 5 |
| All respondents | 81 | 11 | 7 |

Source: NHIS-CEC 1987 (Davis et al., 1990)

2023496580

Table 7. Opinions Regarding Smoking in Selected Public Places
and Worksites, (% of Respondents With the Opinion)
by Smoking Status, 1983, 1985, 1987, 1989

Draft - Do not cite or quote

Hotels and Motels

| | <u>Set Aside Certain Areas</u> | | | <u>Totally Ban Smoking</u> | | | <u>No Restrictions</u> | | | <u>Don't Know</u> | | |
|-----------------|------------------------------------|------------|------------|--------------------------------|------------|------------|------------------------|------------|------------|-------------------|------------|------------|
| | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> |
| Current Smokers | 49 | 61 | | 7 | 6 | | 42 | 30 | | 2 | 3 | |
| Former Smokers | 54 | 72 | | 13 | 9 | | 27 | 16 | | 6 | 3 | |
| Nonsmokers | 60 | 68 | | 15 | 14 | | 20 | 15 | | 5 | 3 | |
| All Respondents | 54 | 67 | 63 | 12 | 10 | 12 | 30 | 20 | 18 | 4 | 3 | 6 |

Restaurants

| | <u>Set Aside Certain Areas</u> | | | <u>Totally Ban Smoking</u> | | | <u>No Restrictions</u> | | | <u>Don't Know</u> | | |
|-----------------|------------------------------------|------------|------------|--------------------------------|------------|------------|------------------------|------------|------------|-------------------|------------|------------|
| | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'87</u> | <u>'89</u> |
| Current Smokers | 74 | 79 | | 12 | 7 | | 13 | 13 | | 1 | 1 | |
| Former Smokers | 71 | 74 | | 19 | 19 | | 9 | 6 | | 1 | 1 | |
| Nonsmokers | 65 | 71 | | 26 | 23 | | 7 | 5 | | 2 | 1 | |
| All Respondents | 69 | 74 | 66 | 19 | 17 | 23 | 10 | 8 | 8 | 2 | 1 | 3 |

Worksites

| | <u>Set Aside Certain Areas</u> | | | | <u>Totally Ban Smoking</u> | | | | <u>No Restrictions</u> | | | | <u>Don't Know</u> | | | |
|-----------------|------------------------------------|------------|------------|------------|--------------------------------|------------|------------|------------|------------------------|------------|------------|------------|-------------------|------------|------------|------------|
| | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> | <u>'83</u> | <u>'85</u> | <u>'87</u> | <u>'89</u> |
| Current Smokers | 64 | 76 | 72 | | 11 | 4 | 8 | | 21 | 19 | 18 | | 4 | 1 | 2 | |
| Former Smokers | 68 | 80 | 73 | | 14 | 12 | 16 | | 14 | 6 | 8 | | 4 | 2 | 3 | |
| Nonsmokers | 63 | 80 | 67 | | 24 | 9 | 23 | | 9 | 10 | 8 | | 4 | 1 | 2 | |
| All Respondents | 64 | 79 | 70 | 65 | 17 | 8 | 17 | 21 | 15 | 12 | 11 | 10 | 4 | 1 | 2 | 4 |

Source: Gallup Surveys 1983, 1985, 1987, 1989

Table 8. Restrictions on Smoking in Public Places
(% of respondents favoring increase)
by Smoking Status, 1964, 1966, 1970, 1975, and 1986

| <u>Smoking Status</u> | <u>1964</u> | <u>1966</u> | <u>1970</u> | <u>1975</u> | <u>1986*</u> |
|-----------------------|-------------|-------------|-------------|-------------|--------------|
| Current smokers | 34 | 35 | 42 | 51 | 23 |
| Former smokers | 56 | 58 | 61 | 77 | 53 |
| Never smokers | 68 | 67 | 68 | 82 | 63 |
| All Respondents | 52 | 52 | 57 | 70 | 50 |

*The question for the first four surveys read "The smoking of cigarettes should be allowed in fewer places than it is now." The question in 1986 read "There are already enough restrictions on where people can smoke."

Source: Adult Use of Tobacco Surveys 1964, 1966, 1970, 1975, and 1986.

Table 9. Reported Worksite Smoking Policies and Worksite
Exposure to Environmental Tobacco Smoke (% of Respondents), 1986

| <u>Worksite Policy</u> | <u>% Reporting Policy</u> | <u>% Reporting Exposure to ETS</u> |
|------------------------|---------------------------|------------------------------------|
| Not Restricted | 55.4 | 64.8 |
| Restrictive | 42.1 | 53.2 |
| Total Ban | 2.5 | 21.1 |

Source: Adult Use of Tobacco Survey 1986

Draft - Do not cite or quote

BLANK PAGE

Draft - Do not cite or quote

BLANK PAGE

2023496584

CHAPTER 10

THE EFFECTS OF PASSIVE SMOKING AND DAY CARE ON RESPIRATORY ILLNESSES

Glen Bennett MPH

Office of Prevention, Education, and Control
National Heart, Lung, and Blood Institute
Bethesda, MD 20892

1. INTRODUCTION

Reports of the Surgeon General (43) and the National Research Council (27) concluded that children of parents who smoke have more lower respiratory diseases and otitis media. Other reviews (1, 17) showed that children in day care have more upper respiratory illnesses, especially otitis media. The overlap in these findings raises a new concern. Does passive smoking and day care attendance interact to increase the rate of respiratory diseases in infants and young children? This chapter examines the data to determine if evidence exist to support this concern. The chapter begins with a review of the day-care market to show its complexity. Ignoring the diversity of day care might lead to faulty conclusions and recommendations.

2. DAY CARE IN THE U. S.

2.1. GENERAL CHARACTERISTICS

In 1982, 6 million mothers (48.2%) with a child under the age of 5 were in the civilian work force. (28) The most drastic change has been the return of parents to work while their children are infants. (26) These children get care in three basic types of day care delivery systems. They are in-home care, family day care, and group day care.

Parents, relatives, or non-relatives provide in-home care in the home of the child. They also give family day care (day care homes) in a private home other than the child's. (2, 50) Day care centers, including nurseries, provide care for 12 or more children in nonresidential buildings. (17, 49) This sector is almost always subject to government regulation and is the smallest of the 3 sectors. (17) However, centers are the fastest growing segment in the day care market. (1, 24, 28)

Table 1 lists the percent distribution of the type of child day care used by the age of the child. Nine percent (9%) of working mothers were able to care for their children while working. Almost one-third (30.5%) arranged for in-home care of their children. However, day care homes were the predominate source of care, i.e., 40.2%. Table 2 describes the percent distribution of care-givers by the age of the child. Relatives provided child care to 29% and non-relatives provided 27.5% of all day care to children of working mothers. Data in Table 3 show that 22% of all children and almost 25% of infants and toddlers got care in the home of a non-relative. (28)

2.2. REGULATIONS

The U.S. does not have a national policy on child care and efforts to develop one have reached a stalemate. (35) Sponsors have withdrawn the 1980 Federal Interagency Day Care Requirements. However, they continue to serve as a guideline for minimum standards. (49)

Each state regulates its own day care facilities. They have written very tough requirements but enforcement is poor. (35) All states have passed regulations which contain some provisions for health and safety. However, they are not consistent. (17) Licensing practices also vary from state to state. (24) Forty-four (44) states now regulate family day care homes. (49) However, children cared for in their own home are beyond the reach of federal and state policy (17).

2.3. PREVALENCE OF SMOKING

In a 1980 survey, 28.9% of female child care workers smoked cigarettes. This is less than females in general. However, their rates are much higher than those for female elementary school teachers (19.8%) and higher than secondary school teachers (24.3%). (44)

3. RESPIRATORY INFECTIONS

3.1. MAGNITUDE OF THE PROBLEM

Upper respiratory infections are the most common diseases affecting children under 5 years of age. They are important causes of childhood illness and their treatment consumes a large portion of health care resources. (8, 14, 17) Infants average 7-8 acute respiratory infections per year. Older children, 1-5 years of age, average one or two fewer infections than infants. (17)

Acute otitis media (AOM) is the most common complication of upper respiratory diseases in infants and young children. (16, 18, 31, 47) AOM is the largest single cause of morbidity with possible sequelae in children. (47) Recurrent episodes are also very common

in children during the first years of life. (23) AOM account for one-third of pediatric office visits (31) and three-fourths of follow-up visits. (16) Nearly all children have at least one episode with effusion (OME) during their first 6 years of life. Some develop chronic OME or chronic otitis media with perforation and discharge. (45) Repeated episodes of OME in early life may lead to transient or permanent hearing loss and impeded speech. These conditions may then lead to developmental or educational delays. (17, 47)

Bronchiolitis is the most common manifestation of lower respiratory infections in infants and small children. The true incidence is unknown. However, about 10 per 1,000 infant are hospitalized with bronchiolitis. The mean age for respiratory syncytial virus (RSV) bronchiolitis is 7.8 months and the peak age is 2 months. Half of children hospitalized for the condition are under 3 months of age. (42)

3.2. DAY-CARE AND RESPIRATORY INFECTIONS

Respiratory diseases are the most common ailments affecting children in day care. (1) Today, infants and pre-school age children get infections at earlier ages and are spending more time outside the home. A common factor in this changing pattern is the increasing popularity of day-care centers. (24) Day care centers with many children in the same place create favorable conditions for respiratory epidemics. (30) However, the total burden of respiratory diseases seems no greater for the day care child. They simply occur at younger ages. (1)

The association of day care and respiratory diseases began in the 1920's. (17) In the 1970's, Scandinavian researchers (19, 23, 31, 32, 39, 41, 45) found an increased rate of otitis media among children in day care. Children in centers had the highest rate. Those in family day care held an intermediate position between centers and in-home care. Moreover, home-reared children with abnormal findings at first testing were significantly more likely to have normal results at subsequent testings.

There are obvious difficulties in transferring the results from studies conducted in Scandinavian countries. However, Haskins (17) concluded that the high quality of these studies make the findings worthy of careful attention. They show that children in day care are at 2-3 times the risk of otitis media as those reared at home.

Two American research teams (14, 42) confirmed the Scandinavian results. Visscher and colleagues (47) studied patients in a large pediatrics group practice in Minneapolis. They collected data on every child attending the clinic during a 2-week period in February, 1982. Cases were patient presenting with AOM on a study day. Controls had a diagnosis other than AOM and no prior history of otitis. Attending a day care facility was the second most

important risk factor. The risk increased with the number of other children at the facility. Exposure to smokers was not a risk factor.

Fleming and colleagues (14) also studied childhood infections in Atlanta. They found that children attending day care were significantly more likely to have an upper respiratory tract infections during a 2-week. Maternal smoking also increased the risk. The effects of attending day care and smoking mothers were independent. Age and living in crowded conditions were also risk factors. The researchers estimated that 31% of upper respiratory infections can be attributed to day care attendance.

Most studies of bronchiolitis focused on children in hospitals. Comprehensive studies of this disease in ambulatory patients or day-care centers are lacking. (42) However, a Chapel Hill, NC study compared the rates of bronchiolitis in a day care center and a pediatric practice. The rate was much higher in the day care center for children 6 months of age or younger. However, the proportion of cases requiring medical treatment and hospitalization was less among day care children. (10)

Reviewers (1, 17, 18, 19) have identified problems which limits the generalization of the findings from these studies. They are:

1. Control groups were less than satisfactory. Researchers observed children in day care more frequently than those in home care.
2. Some studies reported symptoms while others used diagnostic categories.
3. The ages of children studied and the manner of reporting illnesses by age category differed widely.
4. The reliability of case-controlled and cohort studies depends on the accurate quantification of disease occurrence. This raises the questions of whether day care parents seek a physician for their children's illnesses more frequently. When a day care provider suggests taking a child to a physician this might have important effects on parents.
5. Most studies did not control for other factors that probably influence the incidence of respiratory illnesses. These factors include housing, humidity, ventilation, passive smoking, and other air pollution.

Nonetheless, reviewers concluded that most studies have shown an increase in respiratory diseases among children in day care. There is stronger evidence for initial and recurrent otitis media. (17) The rate of otitis is greater in large group day care centers and

probably smaller day care homes. (2, 17, 18, 31) Studies also show reduced rates of both symptoms and acute illnesses with increasing age in all sites. However, there is very little evidence of an excessive rate of illness in day care children for the more serious respiratory diseases. (17) Asymptomatic children do not have higher levels of respiratory tract pathogens or even different pathogens than children reared at home. (1, 17, 40) However, The true incidence of infectious disease in family day care is unknown since most of it is unlicensed. (2)

3.3. PASSIVE SMOKING AND DISEASES IN INFANTS AND CHILDREN

A number of studies have demonstrated a positive association between passive smoking and lower respiratory symptoms (4, 5, 13, 36) and diseases. (11, 12, 22, 29, 48) The effect was stronger in infants. Maternal smoking, when measured, showed a high correlation. However, paternal smoking was rarely significant.

Studies on the relationship of passive smoking to the development of bronchiolitis are less clear. Two studies (32, 38) showed a positive association with maternal smoking. However, another study (29) did not find a relationship.

Otitis media is the only upper respiratory disease reported in the literature as being associated with passive smoking. Five studies (3, 20, 21, 30, 34) showed an increased incidence of otitis media with maternal smoking. However, in five other studies (14, 39, 45, 46, 47) parental smoking was not significant. However, the study by Fleming and colleagues (14) included only 34 cases among the 575 children with upper respiratory illnesses. Pukander and colleagues (30) also suggested that day care attendance may mask the effect of parental smoking.

Two comprehensive reviews (27, 43) concluded that lower respiratory diseases and otitis media occur more frequently in children with mothers who smoke. Two researchers (29, 48) offered explanations for the association with only maternal smoking. They argued that children are more likely to be with their mothers at the times smoking occur. Some mothers also remain at home with the child. This suggests that the duration of exposure to smoke rather than just the presence of a smoker is the more important factor.

Both reports (27, 43) emphasized the need for caution in the interpretation of these studies. Independent risk factors, such as age and sex, were not always taken into account. The use of questionnaires to collect information on symptoms are prone to recall bias. Most studies examined only the effects of exposure to parental smoking, excluding exposures outside the immediate family. Future studies must control for potential confounding variables.

3.4. DAY CARE AS A CONFOUNDING VARIABLE

Passive smoking increases the risk of upper and lower respiratory diseases in infants. Day care attendance also increases the occurrence of upper respiratory infections and perhaps some lower respiratory illnesses in infants and toddlers. However, studies focusing primarily on the effects of passive smoking did not control for day care attendance. Many of the studies on day care infections did not consider parental smoking as a possible confounding variable. Moreover, none of the studies in either area considered the smoking habits of day care workers.

Seven of the day care studies (14, 19, 30, 39, 45, 46, 47) did consider parental smoking. Two of these studies (14, 30) found an independent effect for both day care attendance and maternal smoking. The effect of day care was strongest in both cases. The remaining studies showed a statistical significance for day care attendance only.

It is unfortunate that researchers have ignored the smoking habits of day care givers. Especially since the duration of exposure is important. (29, 48) Smoking by day care workers exposes the child to smoke. The Section on Allergy of the Canadian Pediatric Association (37) provided support for this premise. They reported that infants admitted to hospitals for chest problems had significantly more day care givers who smoke than did control infants.

The smoking practices of workers in day care homes deserve special attention. This sector includes more children and is especially popular with mothers of infants and toddlers. Day care providers who smoke probably spend as much time with these children as their mothers. Thus, the smoking habits of these workers potentially confound the results of studies of the effect of parental smoking.

4. RECOMMENDATIONS

4.1. REGULATIONS

Existing day care regulations clearly are deficient in mandating a safe and healthy day care environment. Federal regulation, while desirable, is not possible now. The prevailing attitude today is away from federal intervention and toward state and personal responsibility. (49) The regulation of day care homes, which contain the most children, is an especially delicate issue. Increased regulation of homes might have the effect of actually decreasing the availability of this mode of child care. (2) Moreover, the sheer number of providers and the small size of these units would make effective oversight difficult. (17)

The most important interim steps are to give parents better information and improve state regulations that relate to health. (17) Requiring all facilities to have written policies on health and give copies to parents is a start. Parents should also be informed about the potential interaction between passive smoking and day care on the risk of early childhood infections. (14)

4.2. RESEARCH

The sparse data available regarding family day care make it important to pay more attention to this mode. Since day care homes includes more children, particularly infants and toddlers, it is important to understand the disease experiences in these homes. (2)

Surveys are needed to determine the smoking patterns of day care workers. Data from the National Health Interview Surveys, 1978-1980 put the prevalence of smoking among female child care workers at 28.9%. However, these data excluded private household child care workers.

4.3. EDUCATION

Presently, Parents must judge for themselves the quality of care given to their children. However, most parents do not know what to look for in a day care setting and there are no federal standards. (35, 50) There are, however, guidelines that the child development community supports. (35) There is also a checklist that can differentiate between centers of high and low quality. The checklist includes one item on smoking: "Adults do not smoke in rooms where children are." (7, 35) Education efforts to disseminate this information are needed. Low-cost materials must also be available to day care providers. (1)

5. CONCLUSION

The children of working parents are receiving day care primarily in their own home, family day care homes, and day care centers. Family day care is the largest of the three sectors but day care centers represent the fastest growing segment. Studies, mostly in Scandinavian countries, have demonstrated that children attending day care have more respiratory infections. The effect was stronger among infants and toddlers.

Another group of studies have linked parental smoking, primarily maternal smoking, with an increase in respiratory diseases among infants. However, most of these studies did not control for attending day care. The few studies that controlled for parental smoking and day care showed a consistent and positive association for day care. Parental smoking was less clear. None of the studies, however, controlled for the exposure to smoke from day care workers.

Draft - Do not cite or quote
Studies controlling for potential confounding factors are urgently needed in this area. The smoking practices of day care workers, particularly day care homes, may have been a major uncontrolled factor in past studies.

In the interim, parents must be educated. They must know about the harmful effects of parental smoking and the potential for added exposure from day care workers. Some 58% of one sample attended full-time day care, i.e., 40 hours or more per week. (14) Thus, children of nonsmoking parents are not without risk. Staying with day care smokers may increase their exposure to smoke similar to that with smoking parents. Children of smoking parents may face as much as twice the exposure. This has special implications for day care homes. First, the children are younger. They also spend most of the time in a smaller environment with other children and the day care worker. If smoking occurs, the exposure should not be materially different from that found in the home.

Day care providers must also know about the possible interaction of passive smoking and day care attendance. Those in day care homes, particularly, should not smoke in the presents of the children. Since strict regulations of this sector in not possible, the parents must insist upon this practice.

Day care centers, while providing a different environment, should adhere to the same principle. They are similar to the school system where teachers can not smoke in the classroom. State regulatory agencies should also include this provision in the licensing of day care facilities.

SUMMARY

1. Studies have linked both parental smoking and day care attendance with increased respiratory infections. Smoking by daycare workers may have been a major uncontrolled confounding factor in studies of infections caused by maternal passive smoking.

2. Parents and daycare providers should be educated to know about the harmful effects of parental smoking and the potential for added exposure from day care workers, which could double total ETS exposure.

3. State regulatory agencies should include prohibitions against smoking in daycare as they do in classrooms.

6. REFERENCES

1. Aronson, SS; Osterholm, M. "Infectious Diseases in Child Care: Management and Prevention. Summary of the Symposium and Recommendations;" Review of Infectious Diseases; 1986, July-Aug; 8(4): 672-679
2. Bartlett, AV; Orton, P; Turner, M "Day Care Homes: The Silent Majority of Child Care;" Review of Infectious Diseases; 1986, July-August; 8(4): 663-671
3. Black, N. "The Aetiology of Glue Ear: A Case-Control Study," International Journal of Pediatric Otorhinolaryngology, 9(2): 121-133; July, 1985
4. Burchfiel, CM; Higgins, MW; Keller, JB; Butler, WJ; Howatt, WF; Higgins, ITT; "Passive Smoking in Childhood: Respiratory Conditions and Pulmonary Function in Tecumseh, Michigan," American Review of Respiratory Disease, 133(6): 966-973, June, 1986
5. Charlton, A. "Children's Coughs Related to Parental Smoking," British Medical Journal, 288(6431): 1647-1649; June 2, 1984
6. Cherian, A and Feldman, W. Personal communications reported in: Section Allergy, Canadian Pediatric Association; "Secondhand Smoke Worsens Symptoms in Children With Asthma;" Canadian Medical Association Journal; 1986, August 2; 135(4): 321-323
7. Clarke-Stewart, A. Daycare, Cambridge, MA: Harvard University Press, 1982
8. Cypress, BK; "Pattern of Ambulatory Care in Pediatrics: The National Ambulatory Medical Care Survey: U.S., January 1980 - December 1981," in Vital Health Statistics, Series 13, No. 75; U.S. Department of Health and Human Services; Publication No. 94-1736; Government Printing Office, 1983
9. Denny, FW; "Childhood Acute Respiratory Tract Infections Deserve Our Attention;" American Journal of Public Health; 1988, January; 78(1): 16-17
10. Denny, FW; Collier, AM; Henderson, FW; Clyde, WA; "The Epidemiology of Bronchiolitis," Pediatric Research, 11: 234-236, 1977
11. Evans, D; Levison, M; Feldman, C; Clark, N; Wasilewski, Y; Levin, B; Mellins, R. "The Impact of Passive Smoking on

Emergency Room Visits of Urban Children ~~Do not asthma~~ quote
American Review of Respiratory Diseases; 1987; 135:
567-572

12. Fergusson, DM; Horwood, LJ; Shannon, FT; Taylor, B. "Parental Smoking and Lower respiratory Illness in the First Three Years of Life," Journal of Epidemiology and Community Health, 35(3): 180-184; September, 1981
13. Ferris, BG; Ware, JH; Berkey, CS; Dockery, DW; Spiro III, A; Speizer, FE; "Effects of Passive Smoking on Health of Children," Environmental Health Perspectives, 62: 289-295; 1985
14. Fleming, DW; Cochi, SL; Hightower, AW; Broome, CV; "Childhood Upper Respiratory Tract Infections: To What Degree is Incidence Affected By Day Care Attendance;" Pediatrics; 1987, January; 79(1): 55-60
15. Fosburg, S; Family Day Care In The United States: Summary of Findings; Government Printing Office, 1981
16. Giebink, GS; "Epidemiology and Natural History of Otitis Media;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; 1984; 5-8
17. Haskins, R; "Day Care and Illness: Evidence, Costs, and Public Policy;" Pediatrics; 1986; 77: 951-982
18. Henderson, FW; Giebink, GS; "Otitis Media Among Children in Day Care: . Epidemiology and Pathogenesis;" Review of Infectious Diseases; 1986, July-August; 8(4): 533-538
19. Ingvarsson, L; Lundgren, K; Olofsson, B; "Epidemiology of Acute Otitis Media in Children-A Cohort Study in an Urban Population;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; Philadelphia: B C Decker; 1984; 19-22
20. Iverson, M; Birch, L; Lundqvist, G; Elbrond, O. "Middle Ear Effusion in Children and the Indoor Environment: An Epidemiological Study," Archives of Environmental Health 40(2): 74-79; March-April, 1985
21. Kraemer, MJ; "Risk Factor for Persistent Middle Ear Effusions;" Journal of American Medical Association; 1983, February 25; 249(8): 1022-1025
22. Leeder, SR; Corkhill, RT; Irwig, LM; Holland, WW. "Influence of Family Factors on the Incidence of Lower Respiratory Illness During the First Year of Life," British Journal of

- Preventive and Social Medicine, 30(4): 203-212, December, 1976
23. Lundgren, K; Ingvarsson, L; Olofsson, B; "Epidemiological Aspect in Children With Recurrent Acute Otitis Media;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; Philadelphia: B C Decker; 1984; 22-25
 24. Marwick, C; Simmons, K; "Changing Childhood Disease Pattern Linked With Day-Care Boom;" Journal of American Medical Association; 1984, March 9; 251(10): 1245-1247, 1250-1251
 25. McConnochie, K; Hall, C; Barker, W; "Lower Respiratory Tract Illness in the First Two Years of Life: Epidemiologic Patterns and Costs in a Suburban Pediatric Practice;" American Journal of Public Health; 1988, January; 78(1): 34-39
 26. Morgan, G; Stevenson, C; Fiene, R; Stephens, K; "Gaps and Excesses in the Regulation of Child Care: Report of a Panel;" Review of Infectious Diseases; 1986, July-August; 8(4): 634-643
 27. National Research Council; Environmental Tobacco Smoke - Measuring Exposure and Assessing Health Effects; Washington, DC: National Academy Press; 1986
 28. O'Connell, M; Rogers, CC; "Child Care Arrangements of Working Mothers: June 1982;" Current Population Reports (Bureau of Census); 1982; Special Studies P-23; No. 129
 29. Pedreira, F; Guandolo, V; Feroli, E; Mella, G; Weiss, I; "Involuntary Smoking and Incidence of Respiratory Illness During the First Year of Live," Pediatrics, 1985; 75: 594-597.
 30. Pukander, J; Luotonen, J; Timonen, M; Karma, P; "Risk Factors Affecting the Occurrence of Otitis Media Among 2-3 Year Old Urban Children;" Acta Otolaryngology [Stockholm]; 1985, September-October; 100(3-4): 260-265
 31. Pukander, J; Sipira, M; Karma, P; "Occurrence of and Risk Factors in Acute Otitis Media;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; Philadelphia: B C Decker; 1984; 9-13
 32. Pullan, CR; Hey, EN. "Wheezing, Asthma, and Pulmonary Dysfunction 10 Years After Infection With Respiratory Syncytial Virus in Infancy," British Journal of Medicine, 284(6330): 1665-1669, June 5, 1982

- Draft - Do not cite or quote
33. Ruopp, R; Travers, J; Glantz, F; Coelen, C. Children At the Center: Summary Findings and their Implications; Cambridge, MA: Abt Books; 1979
 34. Said, G; Zallokar, J; Lellouch, J; Patois, E; "Parental Smoking Related To Adenoidectomy and Tonsillectomy in Children," Journal of Epidemiology and Community Health, 32(2): 97-101; June, 1978
 35. Scarr, S; Mother Care, Other Care; New York: Basic Books; 1984
 36. Schenker, MB; Samet, JM; Speizer, FE "Risk Factors for Childhood Respiratory Disease: The Effect of Host Factors and Home Environmental Exposure," American Respiratory Disease, 128: 1038-1043; 1983
 37. Section Allergy, Canadian Pediatric Association; "Secondhand Smoke Worsens Symptoms in Children With Asthma;" Canadian Medical Association Journal; 1986, August 2; 135(4): 321-323
 38. Sims, DG; Downham, M; Gardner, PS; Webb, J; Weightman, D. "Study of 8-Year-Old Children With A History of Respiratory Syncytial Virus Bronchiolitis in Infancy," British Journal of Medicine, 1(6104): 11-14, January 7, 1978
 39. Stahlberg, MR; "The Influence of Form Day Care on the Occurrence of Acute Respiratory Tract Infections Among Children;" Acta Paediatric Scandinavia [Supplement]; 1980; 282: 1-87
 40. Strangert, K; Carlstrom, G; Jeansson, S; Nord, CE; "Infections in Preschool Children In Group Day Care," Acta Paediatric Scandinavia, 65: 455-463, 1976
 41. Strangert, K; "Respiratory Illness in Preschool Children With Different Forms of Day Care," Pediatrics, 57(2): 191-196; February, 1976
 42. Task Force on Epidemiology of Respiratory Diseases; Epidemiology of Respiratory Diseases; Division of Lung Diseases, National Heart, Lung & Blood Institute; November, 1981
 43. Public Health Service, The Health Consequences of Involuntary Smoking: A Report of the Surgeon General, U.S. Department of Health and Human Services, Rockville, MD: Government Printing Office, 1986
 44. Public Health Service, The Health Consequences of Smoking: Cancer and Chronic Lung Disease in the Workplace, U.S.

Department of Health and Human Services, DHHS (PHS)
85-50207, 1985

45. Van Cauwenberge, PB; Kluyskens, PM; "Some Predisposing Factors in Otitis Media With Effusion;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; Philadelphia: B C Decker; 1984; 28-32
46. Vinther, B; Elbrond, CB; "A Population Study of Otitis Media in Childhood," Acta Otolaryngology, [Stockholm] Supplement 360: 135-137; 1979.
47. Visscher, W; Mandel, JS; Batalden, PB; Russ, JN; Giebink; GS; "A Case-Control Study Exploring Possible Risk Factors for Childhood Otitis Media;" in Lim, DJ; et al; Recent Advances in Otitis Media With Effusion; Philadelphia: B C Decker; 1984; 13-15
48. Ware, JH; Dockery, D; Spiro, A; Speizer, F; Ferris, B. "Passive Smoking, Gas Cooking and Respiratory Health of Children Living in 6 Cities;" American Review of Respiratory Diseases; 1984, March; 129(3): 366-374
49. Young, KT and Zigler, E; "Infant and Toddler Day Care: Regulations and Policy Implication," American Journal of Orthopsychiatry, 1986, January; 56(1): 43-55
50. Zigler, E; Muenchow, S; "Infectious Diseases in Day Care: Parallels Between Psychologically and Physically Healthy Care;" Review of Infectious Diseases; 1986, July-August; 8(4): 514-520

7. TABLES

TYPE OF CHILD CARE BY AGE OF CHILD

Table 1

| AGE < 1 Year | 1-2 Years | 3-4 Years | TOTAL |
|--------------|-----------|-----------|-------------|
| IN-HOME CARE | 34.3% | 33.3% | 24.6% 30.5% |
| DAYCARE HOME | 42.7% | 43.0% | 35.4% 40.2% |
| GROUP CARE | 5.3% | 11.7% | 25.8% 14.8% |
| MOTHER | 9.2% | 8.6% | 9.9% 9.1% |
| TOTAL | 91.5% | 96.6% | 95.7% 94.6% |

Source: O'Connell and Rogers, 1982 (28)

CARE GIVER BY AGE OF CHILD

Table 2

| AGE < 1 Year | 1-2 Years | 3-4 Years | TOTAL |
|----------------|-----------|-----------|-------------|
| FATHER | 13.9% | 15.8% | 11.0% 13.9% |
| MOTHER | 9.2% | 8.6% | 9.9% 9.1% |
| GRANDPARENT | 22.4% | 16.8% | 14.6% 17.2% |
| OTHER RELATIVE | 11.3% | 12.3% | 12.8% 12.1% |
| NONRELATIVE | 29.4% | 31.4% | 21.6% 27.5% |
| GROUP CARE | 5.3% | 11.7% | 25.8% 14.8% |
| TOTAL | 91.5% | 96.6% | 95.7% 94.6% |

Source: O'Connell and Rogers, 1982 (28)

CAREGIVERS BY TYPE OF CHILD CARE AND AGE OF CHILD

Table 3

| AGE < 1 Year | 1-2 Years | 3-4 Years | TOTAL |
|-----------------|-----------|-----------|-------------|
| IN-HOME CARE | | | |
| Father 13.9% | 15.8% | 11.0% | 13.9% |
| Grandparent | 8.9% | 6.3% | 3.6% 5.9% |
| Other Relative | 5.1% | 5.0% | 5.7% 5.2% |
| Non-relative | 6.4% | 6.2% | 4.3% 5.5% |
| DAY CARE HOME | | | |
| Grandparent | 13.5% | 10.5% | 11.0% 11.3% |
| Other Relative | 6.2% | 7.3% | 7.1% 6.9% |
| Non-relative | 23.0% | 25.2% | 17.3% 22.0% |
| GROUP CARE | | | |
| Nursery | 1.7% | 3.2% | 11.7% 5.6% |
| Day Care Center | 3.6% | 8.5% | 14.1% 9.2% |
| MOTHER 9.2% | 8.6% | 9.9% | 9.1% |
| TOTAL 91.5% | 96.6% | 95.7% | 94.6% |

Source: O'Connell and Rogers, 1982 (28)

Draft - Do not cite or quote

FIGURES AND TABLES FOR CHAPTER 10

CHAPTER 11

NO SMOKING POLICIES AT THE WORKSITE

A Look at What Companies Are Doing Today

Ruth Behrens*

Washington Business Group on Health

The movement of businesses to develop and implement smoking control policies appears to be strong, and may even be gaining momentum.

A national survey released in 1987 by the Office of Disease Prevention and Health Promotion, U. S. Department of Health and Human Services, found that 27 percent of all U.S. companies with 50 or more employees had a formal smoking policy. Of these, 40 percent reported the policy was in place to protect nonsmokers; 40 percent reported the policy was designed to comply with regulations; 13 percent reported a need to protect equipment; and 7 percent advised that the policy was designed to protect employees at high risk for health problems.

A more recent study that looked only at large and medium-sized companies, the 42nd annual Northwestern University Lindquist-Endicott Report, found that 70 percent had restricted, or were prepared to limit, smoking in the workplace. The study was released in early 1988.²

Another study of 916 large and mid-sized U.S. companies, conducted in 1989 by Hay/Huggins, a management consulting firm, found that 81 percent of surveyed firms with revenues of \$1 billion or more restrict smoking; the percent dropped to 65 percent for companies grossing less than \$200 million per year.³

A 1989 survey by the Gallup Organization commissioned by the American Lung Association found that 21 percent of individuals surveyed supported a total ban on smoking at the worksite, with an additional 65 percent in favor of smoking only in designated areas.⁴

The development and implementation of a no smoking policy within a business is a multi-faceted process. Experiences of the growing number of companies that have developed written statements spelling out how smoking will be limited or prohibited illustrates vividly that the process involves many individuals and groups, and that deliberations often are emotionally charged.

This chapter contains a series of case studies outlining how several companies have successfully approached this process. But before discussing company-specific examples, there is merit in examining some of the key issues that must be looked at by any company considering developing a no smoking policy. Among the questions to be answered are:

- o What kind of specific smoking restrictions are best for the company?
- o What benefits can be realistically anticipated from the policy?
- o How should employees be involved?
- o How should unions be involved?
- o What kind of education should be offered and to whom?
- o What kind of incentives should be offered?
- o How should the policy be enforced?

Further details about each of these steps are contained within the "Case Studies" section of this chapter.

Options for Smoking Restrictions

Restrictions on smoking in the worksite are not new.

For years--even decades--businesses have had policies that banned smoking in specific areas such as elevators, hallways, auditoriums, sections of cafeterias, laboratories, rooms with delicate equipments, etc. In many instances, these restrictions were imposed because of laws or ordinances requiring them or to protect property. Before the 1980s, they were seldom implemented for health reasons. The assumption was, of course, the entire company is considered a Smoking Permitted area unless otherwise specified.

Another type of policy began appearing with regularity in the mid and late 1980s. It banned smoking throughout the company except in designated areas. While many of these policies did not necessarily put greater limits on smoking--often allowing offices and work areas, special lounges, large parts of the cafeterias, etc, to be designated as Smoking Permitted areas, they did set the precedent that the company is Smoke Free except in specified areas.

While the difference between these two types of policies may seem subtle at first glance, there is a strikingly different corporate

philosophy underlying the two approaches. And in the late 1980s, it was this latter approach--establishing a smoke free company, possibly with a few, carefully selected areas that permit smoking--that appeared to be setting the pattern for worksite smoking policies.

According to a spokesperson for Texas Instruments, Inc. (TI), determining what approach to take in limiting smoking was the most difficult aspect of developing and implementing its policy.

As TI and many other companies have found, designating even a few smoking areas within a company can still pose serious health hazards for employees. Smoke from lounges, cafeterias, hallways, and enclosed offices, gets into the ventilation system and is circulated throughout the building, including into no smoking sections. (See "Case Studies: Pacific Northwest Bell.") As an interim step in a phased-in nonsmoking work environment, Pacific Mutual Life Insurance Company, Newport Beach, California, installed electronic filters in the temporary smoking area of its cafeteria.

TI chose to avoid this problem by eliminating smoking from the worksite except for designated smoking areas which were, to the extent possible, separately ventilated. Similarly, the headquarters complex of General Telephone of California prohibited smoking in all areas except a small portion of the cafeteria that has its own ventilation system.

For others like American Family Insurance Group, Madison, Wisconsin, Pennsylvania Blue Shield, and UNUM Life Insurance Company, Portland, Maine, the choice to provide separate ventilation was either too expensive or physically impossible, so they chose to ban smoking completely at the worksite. On October 1, 1987, Ralston Purina's headquarters in St. Louis, Missouri, became the first Fortune 500 company to completely ban smoking in its facilities.

Clearly, more and more companies are banning smoking or severely limiting it. Most require that all visitors abide by the company's regulations. Some will not allow smoking on company property, including grounds and parking lots. Groups like Michigan Bell, which has a large number of motor vehicles, are expanding their bans to all company-owned vehicles. However, others are voiding a ban in company cars and trucks because they believe enforcement will be virtually impossible.

A few companies have gone even further, and may be bellwethers for a future trend. These companies require that all new employees sign a statement that they are nonsmokers, even on their own time. Company policies prohibiting the hiring of smokers got nationwide publicity when Acoustical Products Company, a subsidiary of Chicago-based US Gypsum Corporation, announced that because of exposures to fibers that could have adverse health effects, all present workers were required to quit smoking or face termination,

and in the future, only nonsmokers would be hired. The Non-Smokers Inn in Dallas, Texas, provides only nonsmoking rooms and hires only individuals who do not smoke. At Cardinal Industries, Columbus, Ohio, new employees must state on the application form whether or not they smoke, and only nonsmokers will be hired; but the company does not make any effort to validate applicants' statements. Louisiana Pacific Corporation, a Portland, Oregon-based national timber company with 15,000 employees, does not hire smokers in any of its plants or in corporate offices "because of the medical costs, absenteeism, environment of smoke in the workplace, the fire problems in the mills, and lung cancer."²

The vast majority of companies still do not require that new employees be nonsmokers. But many companies with strict bans are seeing fewer smokers apply. "Why would a smoker want to work for us," one company spokesman said, "when we deprive him of his habit for eight hours every workday?"

Benefits of No Smoking Policies

Developing and implementing a worksite no smoking policy may not be easy and may cause some discomfort for smokers and management alike. So why do companies do it? What benefits do they receive?

In a recent national survey of all types of worksites with 50 or more employees, the Office of Disease Prevention and Health Promotion, U. S. Department of Health and Human Services, asked those with smoking programs what benefits they perceived.

- o 41 percent said smoking control policies and programs improved employees' health;
- o 16 percent said they increased employees' productivity;
- o 9 percent said they improved morale, and
- o 8 percent said smoking control activities reduced costs.¹

Some companies have conducted evaluations of the results from their smoking control efforts. Several of these studies, along with some anecdotal findings, are reported in this chapter's Appendix, "The Economic Justification for No Smoking Policies."

To many companies, a reduction in the number or percent of employees who smoke is benefit enough from a policy. Smokers dropped from 21 percent of the workforce to 16 percent in two years at UNUM Life Insurance Company. In addition, 87 percent of the smokers reported they were smoking less after the policy was implemented.⁶ At Pacific Northwest Bell, smokers dropped from 28 percent at the time the ban was implemented to just 20 percent of employees two years later.

Employee Involvement

Some companies, especially those wanting quick results that can be controlled, develop smoking policies at the top executive or management level and announce them to the employees. But a more frequently seen pattern today involves employees in the process of formulating and implementing a policy from the outset--but with varying degrees of direction from management. Companies have found that involvement of employees, including smokers, facilitates compliance with the resulting policy.

In some companies, the involvement takes the form of responding to a charge. For example, an employee committee might be asked to examine the issues and problems related to smoking at the worksite and to present to management within three months recommendations for a policy and implementation plan to deal with them. In others, management may decide that smoking is a serious health hazard to its employees and that smoking is to be eliminated in 12 months. This organization's charge to employees might be to review how other companies have successfully moved to a smoke free workplace and to present recommendations for steps the company should undertake during the next 12 months to make that transition both smooth and as painless for smokers as possible.

Regardless of the approach, if employees are to be involved, it is important that their contributions have meaning and be listened to objectively by management.

When tracing the history of smoking policies in organizations, it is not unusual to find that the initial push to limit or eliminate smoking came not from management, but from the employees, themselves.

At UNUM Life Insurance Company, employees' complaints, coupled with a Maine law requiring employers to reduce smoking, resulted in the company-wide ban. Pacific Northwest Bell emphasizes that no company officer or executive advocated its move to implement a smoking policy. Rather, the impetus came from employees. A grass roots group conducted a survey of workers and eventually recommended that PNW Bell ban smoking. The Employee Advisory Council at Cardinal Industries' Sanford, Florida, plant initiated the idea of a tough no smoking stand. (See "Case Studies--Cardinal Industries and Pacific Northwest Bell")

At Holiday Corporation, Memphis, Tennessee, a task force of employees developed a Clean Air Policy covering its headquarters offices. The task force was originally set up as a Wellness Committee a full year before work began on the smoking policy. The employee group researched various aspects of the smoking problem by gathering data, talking to other companies that had already done

it, and working with the local cancer society and lung association. A survey was conducted of all employees to identify their habits and attitudes related to smoking. The task force, itself, created the phased-in process that resulted in Holiday Corporation headquarters and several of its subsidiary groups going smoke free on January 1, 1987.

But the act of involving employees is not always as easy as it might seem, according to Charles Nielson of Texas Instruments. It is important to involve employees in the process of developing a policy as early as possible, and a survey of their habits and attitudes provides invaluable data to management, says Nielson. Because TI has so many locations, however, timing of an employee survey was sometimes very difficult; in some locations, the policy had already been set by corporate headquarters before the attitude survey could be conducted. As a result, some employees felt they were being manipulated. "Data is vital to planning, but timing is also important so that the company maintains its credibility," cautions Nielson.

Union Involvement

In any unionized organization, consideration must be given at the outset to how and when unions will be involved. Popular thinking just a few years ago was that unions would block most company-sponsored wellness efforts, particularly those that interfered with individual lifestyle choices, such as smoking. But through the work of several pioneering unions such as the Amalgamated Clothing and Textile Workers Union, the United Steelworkers Union, and the United Auto Workers, as well as the efforts of national groups including the Workplace Health Fund, more and more labor groups are willing to cooperate with management in reducing smoking if they are approached properly--and early in the process.

Unions also recognize that their membership reflects closely the national averages, therefore the vast majority of their members do not smoke. As a result, many unions are receiving increased pressure from their membership to help control smoking in the workplace. After having been involved in all aspects of policy development, the Communications Workers of America sent a memo to its 8,000 members at Pacific Northwest Bell acknowledging that the company was implementing a smoking ban, but stating that CWA would not oppose it because of the possibility that nonsmoking members would sue the union--and probably win. (See "Case Studies: Pacific Northwest Bell.")

In late 1985, the Workplace Health Fund, in cooperation with the Office of Disease Prevention and Health Promotion, (US DHHS), held a conference of union people to discuss the merits and value of health promotion. One of the outcomes of the meeting was a set of criteria for union involvement in worksite wellness efforts.

Among the recommendations were two that placed heavy emphasis on the need to have a good working relationship between the union and management before attempting to implement any kind of wellness program. "Worksites in which labor and management are not cooperating to bring health and safety hazards under control should not be sites for health promotion activities." In addition, "where the worksite is not under control or the employer is uncooperative, and where the union has established the need for health promotion, the programs should be conducted outside the worksite."

But for any unionized company considering a smoking policy, the first step must be to look carefully at its union contracts, particularly for any wording that might guarantee members the right to smoke. If such agreements exist, the likelihood of the union supporting a no smoking policy is slim.

Sue Pisha, area director of the northwest region of the Communication Workers of America, believes that with motivational information and education, there is the potential for unions to eventually become a proactive force for nonsmoking policies. "Policies seem to eliminate in-fighting," she says. "Without a policy, the issue is messy and polarizing."

Education

A companion element of virtually every successful workplace no smoking policy is an educational program designed to inform employees about the new rules and to provide opportunities for smokers to kick the habit. While behavior modification programs are the most commonly presented, some companies have offered innovative approaches such as acupuncture, hypnosis, self-help materials, hot lines, incentives for nonsmoking employees to encourage and assist their co-workers to quit, and multi-day intensive programs for hard-core smokers.

Now that the nicotine in tobacco is widely recognized as an addictive substance, in much the same way that alcohol and drugs are considered addictive, other education techniques also have come into use. They include aversion techniques such as satiation and rapid smoking, relaxation training, coping skills training, stimulus control, and nicotine fading.

In addition to on-site opportunities, businesses have gotten good results by encouraging participation in community-sponsored stop smoking classes merely by providing lists of sessions available through reputable groups such as cancer and lung associations, hospitals, Y's, and for-profit organizations.

Because quitting can be very difficult and often is greatly enhanced by peer and family support, many companies make cessation

opportunities available to spouses and other immediate family members, as well. (See "Incentives.")

UNUM Life Insurance Company offers classes for a usually overlooked group, nonsmokers. The classes are designed to help those who do not smoke understand the problems faced by smokers trying to quit and to urge them to encourage fellow workers to quit or to refrain from smoking. At Rainier Bank, Seattle, Washington, stress management classes were offered to help smokers adjust to the policy as well as to assist those who were trying to quit.

While no national data are available on worksite quit rates, strong worksite programs claim anywhere from 20 to 50 percent quit rates after one year. However, most published studies report six-month abstinence rates of 30 percent or less.¹⁰ As a result of an intensive smoking cessation campaign, Johnson & Johnson, New Brunswick, New Jersey, reports a two-year success rate of 23 percent of all smokers in the company, not just 23 percent of those who went through a program or completed it.¹¹

Incentives

Many companies go a step beyond offering cessation classes by providing incentives for smokers to quit. Some also have devised rewards for non-smokers. The most widely used incentives for smokers are monetary, often tied to completing a cessation program and/or stopping smoking. Many companies offer cessation classes free to employees and their families, often during company time, or reimburse them for the cost of taking a community-based class. Others, like the Utah State Department of Health, reward smokers who actually quit. The "Healthy Utah" programs pays \$25 to smokers who quit at the end of three smoke-free months, another \$25 after six months, and \$50 at the end of a year of not smoking.¹²

Nonmonetary incentives, too, can be appealing. Employees who participated in a 24-hour "Cold Turkey" stop smoking day at MSI Insurance, Arden Hills, Minnesota, became eligible for a drawing for a frozen turkey. Those who quit for six months were eligible for a drawing for a free YMCA membership, and anyone who stayed off cigarettes for a full year was eligible for a weekend vacation.¹³

Some companies also have gotten creative in finding ways to reward employees who are nonsmokers or who quit before a policy goes into effect. Employees who take a health risk appraisal at Westlake Community Hospital, Melrose Park, Illinois, receive a \$50 "bounty" for participating plus several "good health bonuses" including \$25 for not smoking. Weekly paychecks at Speedcall Corporation, Hayward, California, include an extra \$7.00 for those who do not smoke at work. Backsliders who light up one week and lose their reward are encouraged to get back quickly to not smoking; so the next week without smoking earns the \$7.00 bonus again.¹²

Businesses also offer nonsmokers discounts on life and health insurance, a very visible and tangible incentive to stop smoking and improve health.

Smoking Policy Enforcement

Without a doubt, one of the most difficult questions asked by companies considering a smoking policy is "How can a no smoking policy be enforced?" The response from most businesses that have moved to a ban is that the company must first demonstrate to employees that it is serious about eliminating smoking in all or parts of the building. Second, it must handle violations in the same way that infractions of all other personnel policies are dealt with.

Cardinal Industries had a highly visible and dramatic way of demonstrating its commitment. Its president, Austin Gurlinger, a cigar smoker, stated to all employees that he would refrain from smoking at the workplace.

Making certain that each employee receives a copy of the policy in advance of its implementation and posting signs clearly delineating where workers may and may not smoke are small steps that can help show a company's commitment to smoking controls and increase compliance, as well.

Some companies are enforcing their no smoking policies by referring employees who are unable to quit because they are addicted to nicotine to an Employee Assistance Program. These companies may apply the same enforcement guidelines to addicted smokers as they do to users of alcohol or drugs, requiring that they overcome the habit in order to remain with the company.

Most companies say that no employees have quit their jobs because of the new rules. However, most also point out that a few have "tested" the policy, with some pushing it all the way to probation. According to Dick Becker, employee services representative for American Family Insurance Group, "Some employees tested the waters, sneaking cigarettes in the rest rooms. Supervisors let it be known that smoking would be treated like any other violation of policy, for example, inappropriate dress."⁶ Holiday Corporation follows its usual procedure for violation of any company rule--first a verbal warning, then a written warning, followed by a "final" warning, and if necessary, termination.

But all agree, termination is not the objective. Everything possible should be done to encourage employees to comply, and most feel that peer pressure is the best policing mechanism. However, when an employee continues to break the rules, he or she must be

disciplined appropriately, or the entire policy will crumble. (See "Case Studies.")

CASE STUDIES

The following case studies illustrate how four widely different companies approached the development and implementation of a policy to reduce or eliminate smoking within their organizations.

CARDINAL INDUSTRIES, INC.

Overall Policy: A total ban on smoking on any company property exists; all new employees must attest to being nonsmokers.

Beginning January 1, 1987, the 8,650 employees of Cardinal Industries were assured of a totally smoke free work environment. One year prior to the ban, Cardinal, the nation's largest manufacturer of modular homes, had taken an even more dramatic step by instituting a multi-faceted policy that included hiring only nonsmokers as new employees.

Benefits Anticipated

Although insurance carriers are saying it will take 12 to 18 months to see any decrease in insurance rates, Cardinal's management expects to significantly lower operating costs, increase productivity, reduce absenteeism, and eventually pay lower insurance premiums as a result of the new policy. Even more importantly, it expects to improve the health of its key asset--its human resources.

But employees at Cardinal's Sanford, Florida, location--one of four regional sites throughout the country--are convinced they would have gone smoke free even without the corporate edict. Why? Because employees wanted it, and because management recognized the negative impact of smoking on employees' health and productivity. The passage of Florida's Clean Indoor Air Act in October, 1985, focused attention on the plant's efforts and established it as one of the most progressive worksite no-smoking policies in the state, stimulating a letter of commendation from the governor.

Employee Involvement

Because of the nature of materials used at Cardinal, the second largest residential builder in the country, the company had a long-standing policy prohibiting smoking in its five manufacturing plants. But at the Sanford location, the real push for a tough

Draft - Do not cite or quote

policy that extended beyond the manufacturing facility came through its Employee Advisory Council in late 1985. Made up of employees elected by the workers within each department, the Council meets regularly with top management.

Based on employees' suggestions, a three-phase policy was developed and implemented Jan. 1, 1986, that gradually eliminated smoking in meeting rooms, the cafeteria, and other common areas over the next 12 months. As part of the policy, which was designed to make Cardinal smoke-free by the end of the year, the company began hiring only non-smoking personnel. Current employees' smoking privileges (in designated areas) were grandfathered for the remainder of the year.

But before the policy was implemented, it required approval by top management, including the company's 33 year-old founder and president who was a cigar smoker--a situation that has stopped many other companies with good intentions. "We had been looking for ways to reduce our health care costs and at the same time improve efficiency and productivity," said a company spokesperson, "and the evidence about the health consequences of smoking were too powerful to ignore. When you add the fact that Cardinal pays for 100% of employees' health insurance, the decision seemed inevitable."

Enforcement

In many ways, the fact that the chief executive at Sanford was a smoker aided in convincing employees that the plant was serious. The announcement that only nonsmokers would be hired and that there would be no exceptions to the rule--even the president--helped overcome one of company's biggest obstacles to successful implementation...convincing employees that the company is serious about the ban.

A second advantage Cardinal has in terms of enforcement is a highly desirable work environment. It pays top benefits and offers excellent working conditions. An employee must balance sacrificing his/her smoking habit for eight hours each day with sacrificing a job at Cardinal. So far, Cardinal has won every time. Not only has no one quit, but the ban has not even been tested. "They know we are serious, and if they test us, they must be willing to live with the consequences." Management also believes that the long-standing positive environment among employees and management has contributed to the easy transition.

Education

During the 12 months between the announcement and the implementation, various company-paid educational programs and cessation classes were offered. In addition to regular stop

smoking seminars provided after business hours, employees and their families also were offered a hypnosis program, and for those who felt they were addicted to smoking, an intensive two-day, off-site treatment program was provided. FDA approved pharmaceuticals also were offered as quitting aides. During the period preceding the ban, smoking areas within the locations were gradually restricted until, on January 1, 1987, the entire company became smoke free.

Blue Collar Workers

Although no survey has been taken to determine how many employees have quit smoking, a survey taken before the ban was implemented revealed that more white collar employees than blue collar workers were smokers. At the Florida location, for example, some 40 to 45 percent of employees could be classified as "blue collar." But partly because the manufacturing plants were always nonsmoking, there has been no particular problem in implementation.

Off-Job Smoking

In a Position Paper discussing its policy, Cardinal Industries states, "The program only concerns itself with smoking in the workplace and not what employees do on their own personal time. Cardinal Industries never has, and never will try to regulate the activities of its employees on their own personal time." Thus, while Cardinal's application form asks prospective employees whether or not they smoke, and while its policy prohibits the hiring of smokers, no attempt is made to test employees or to check on their off-work habits.

TEXAS INSTRUMENTS

Overall Policy: Smoking is prohibited in all owned and leased facilities except in specific locations in each facility that are designated as smoking areas and, to the extent possible, are separately ventilated.

In late 1985 and early 1986, several of the 37 major sites of Texas Instruments began implementing their own smoking policies as a result of employee complaints and local Clean Air legislation. Rather than be faced with 37 different policies to implement, TI made a decision to implement a single corporate-wide policy.

Employee Habits and Attitudes

Before embarking on policy development, TI surveyed its employees to learn how many smoked and how they viewed worksite smoking restrictions. About half of the more than 50,000 workers surveyed

Draft - Do not cite or quote
took the time to respond, revealing that 77 percent of TI employees were nonsmokers or exsmokers, and that just 23 percent were current smokers. Of those who smoked, over 40 percent said they wanted to quit.

Corporate Objectives and Policy

Before designing the Clean Air Policy, top corporate management agreed on three objectives that would form its underlying philosophy. There were to:

- o provide a healthful and safe working environment;
- o ensure high quality in all TI products; and
- o initiate the company's clean air approach rather than be forced to react to legislation (including the possibility of legislation from many different states and municipalities).

From these objectives grew TI's Clean Air Policy.

"It is the goal of Texas Instruments to provide for its employees a healthful and safe working environment. In accord with this goal, Texas Instruments will prohibit smoking in all TI owned and leased facilities, except for specific locations in each facility which are designated as smoking areas."

Education and Training

To underscore the importance of the new policy, the eight-month, phased-in implementation process took a top-down track, with the President and CEO Jerry Junkins working directly with a key operating manager and the personnel director from each location throughout the organization. During the session, Mr. Junkins emphasized the organization's complete commitment to the new personnel policy and each individual manager's responsibility for its successful implementation. These teams then headed up similar training programs in their own locations. Training sessions were conducted for selected managers using a centrally prepared manual to ensure consistency among the 37 locations. Specially developed brief video tapes offered all employees an introduction to the policy (3 minutes), briefed managers and supervisors on issues related to smoking (10 minutes), and assisted managers and supervisors in learning techniques for resolving smoking-related problems at the worksite (16 minutes).

Making every effort to assist smoking employees to prepare for the new policy, TI provided company-paid smoking cessation programs on company time during the initial phase-in of the clean air program. Classes were scheduled to accommodate workers on all three shifts,

and "maintenance sessions" were offered to provide additional support.

More than 4,700 employees signed up for cessation classes, representing 40 percent of the company's smokers--almost exactly the percent that said they wanted to quit in the employee survey. Of the group, 3,235 completed all the required classes (including maintenance classes), with 1887, or 58 percent, reporting they had quit by the end of the program.

As a further aid, a Tip Sheet, "How to Make Life Easier Until the Next Cigarette Break" provided "some practical suggestions to help you when you need to change your regular smoking routine." A "Wrap Sheet: Daily Cigarette Count," designed to be wrapped around a pack of cigarettes, offered an easy place to keep track of how much was smoked, when and why, in the hope that the information would assist the smoker in altering his/her habits.

However, all communication was not downward! Employees were given opportunities to ask questions and voice concerns during educational programs. Special attention was paid to employees concerns and complaints in in-house communication vehicles, as well.

Facilities Modification

Because TI chose to designate a limited number of areas in each building as smoking areas rather than to completely ban tobacco, it faced the problems of recirculating contaminated air. Thus, where necessary and possible, facilities were modified to provide separate ventilation. In addition, all cigarette machines were removed from TI facilities and a decision was made that no new ones would be installed.

Enforcement

TI made it clear from the beginning that a new personnel policy had been established that would be monitored and enforced in the same way as all other policies, such as attendance. Thus, anyone found smoking in non-designated areas would be given an oral warning. If there were no further problems, no further action would be taken. However, with subsequent smoking incidents, the employee would be given written guidance, followed by probation for additional infractions, with termination as a final step. But TI stressed to all supervisors that they should make every effort to educate smokers about the importance of the policy, rather than to be heavy-handed. After nine months, "two or three cases" have gone to probation, but no one has been terminated because of smoking. Considering that 50,000 to 60,000 employees are covered by the

Draft - Do not cite or quote
policy, this is an excellent record, says Charles Nielson, Vice
President and Manager of U.S. Employee Relations.

Advice: Keep Policy's Purpose in Perspective

Nielson cautions other companies considering establishing a no smoking policy that one of the most difficult problems they face will be keeping the desire to eliminate the health hazards of smoking at the worksite in proper perspective.

TI made a corporate decision to eliminate smoking at the worksite except in designated areas. The decision was a business decision, not a moral or a value judgement. TI, which has 50 percent of its business in semiconductors, is facing intense competition, according to Nielson. Therefore, it must have productive employees. And that means it must have good relationships with all its employees. But smoking is an emotional issue for many people, both smokers and nonsmokers. "I'm not sure those of us in the personnel field have yet learned how to deal with this kind of highly charged issue and still maintain our productivity," states Nielson. "It takes a lot of hard work to achieve the desired atmosphere of teamwork, rather than an adversarial relationship."

RAINIER BANK/RAINIER BANCORPORATION

Overall Policy: Following a one year phase in period, smoking is banned in all 200 domestic facilities and in car pool vehicles.

In September, 1985, the 5,800 employees of Rainier Bancorporation's U.S. facilities received a communication from their President, John D. Mangels stating that "We are committed to insuring a healthful and comfortable environment for all employees." As part of that commitment, he announced, the corporation would become smoke-free on October 1, 1986. As part of a transition plan, beginning October 15, 1985, smoking would be restricted to designated areas, and the company would sponsor and pay for smoking cessation classes to assist employees who choose to quit.

Rainier Bancorporation is headquartered in Seattle, Washington, with 200 offices in Washington, plus Alaska, Oregon, California, Hawaii, Arizona, New York, and the Far East.

Health Threats, Employee Complaints, Legal Concerns Prompt Policy

According to Peter Broffman, personnel officer for Rainier Bank, the major subsidiary of Rainier Bancorporation, the policy resulted from three converging issues, the major one being a concern for

employee health and wellness. Additional factors were an increasing number of employee complaints about smoke in the workplace, and the changing legal and regulatory climate. In July, 1985, the state of Washington had adopted a Clean Indoor Air Act that prohibited smoking in public places, including public areas of banks, and there was reason to believe that unless employees acted on their own initiative, there might also be legislation regarding private workspace. That, coupled with an increasing number of court cases upholding the right of employees to have a smoke free workplace, added impetus to the development of a policy.

Communications Vital to Implementation

Once the decision was made to go forward with a phased-in ban, communications with employees became a key link to successful implementation. Emphasis was placed on the fact that Rainier was prohibiting smoking at the workplace, not smokers.

Phase-In Period

During the transition period, managers were given discretion to determine the most appropriate way to make the transition. The company policy stated that "The needs and 'comfort level' of both smokers and non-smokers should be considered during this period." Guidelines for Phase I stated, in part:

- o All common areas, including lobbies, elevators, conference rooms, hallways, libraries, rest rooms and computer rooms will be smoke free.
- o In open-office work environments, managers should use discretion in deciding whether those areas should be smoke free. Individual employees may, of course, designate their assigned immediate work space as a no-smoking area.
- o Employees with enclosed offices may designate their area as a smoking or no-smoking area. However, the rights of non-smokers who must come into an enclosed office to conduct business should be respected.
- o Lunchroom and lounge areas will be divided into areas for smokers and non-smokers. Managers are given discretion to divide the rooms as appropriate for their locale.

According to Broffman, there were relatively few difficulties in the initial phase of implementation. The few problems that did exist were due largely to differences in the ways various managers chose to implement and police their smoking restrictions. Occasionally disputes arose over what areas should be smoking and

nonsmoking, especially in the smaller branch offices where there were few options for allocating space. For the most part, Broffman says, the problems were minor and easily resolved when the total prohibition was enforced.

However, in retrospect Broffman believes that a shorter transition period might have been more desirable. "A three to six month phase-in period probably would have been adequate," he says. "Many smokers go through a adjustment period. A few indicated that putting off the inevitable ban for too long really isn't doing them a favor because it prolongs the period of anxiety and allows them to procrastinate in making the adjustment. Also, a shorter transition emphasizes the resolve of the company to become smoke free." In addition, any employees who want to defeat the policy will use the entire phase-in period to rally support. A shorter transition period would shorten the debate and lessen the possibility that the detractors will succeed.

Enforcing the Ban

Phase II, the total smoking ban, was introduced in a low-key, matter-of-fact manner: a simple "reminder" that smoking would be prohibited in all work areas. With the exception of minor, final protests by a few "die-hards", employees accepted the new policy. Rainier has received no formal complaints, has had no problem with recruiting, and no one has resigned. The only complaint Broffman is aware of is that a few employees who still smoke do so immediately outside company building during breaks, and some employees are concerned about the impression this gives to customers entering the bank.

Because of its stance that Rainier is eliminating smoke, not smokers, the organization makes no attempt to discriminate against hiring smokers.

Biggest Obstacle to Policy: Fear

Broffman acknowledges that when the policy was first proposed, there was concern on the part of a few senior manager of "what might happen." Although the majority and the leadership of senior management supported the policy, a few were initially concerned that there could be mass defections, that disagreements about smoking would cause major disruptions in work units, and that it could turn into an "employee rights" issue. However, these things did not happen at Rainier.

"We had more complaints from nonsmokers before the policy was implemented than we got from smokers after it was enforced." Broffman says. His advice to other companies considering a smoking ban? "Do it! You can make it work!"

PACIFIC NORTHWEST BELL

Overall Policy: Because of health concerns related to smoke, PNB does not allow smoking in any company facility.

On October 15, 1985, Pacific Northwest Bell became the first large company (15,000 employees in 750 buildings) to go completely smoke free. Its policy is simple:

"To protect the health of PNB employees, there will be no smoking in any company facility."

Options for Smoking Restrictions

Prior to the establishment of the policy, PNB had allowed each work group to decide, itself, whether or not it would be a smoking area. Problems arose, however, when adjacent work groups had differing approaches. Smoke would drift around barriers, waft across no-smoking desks, and generally infiltrate all areas of the building. Smokers assigned to no smoking areas would merely walk into work groups that permitted smoke, making the atmosphere even worse for nonsmokers in the area. Difficulties occurred even within individual units that voted to eliminate smoking. If 60 percent voted to be a clean air area and 40 percent voted for smoking, the question arose as to whether the wishes of four-out-of-ten employees could really be ignored.

While this kind of democratic approach had initially sounded like an easy way to avoid forcing a company-wide policy, it was seen as unfair and inequitable by most workers. No one was really satisfied and all the underlying problems still existed. Eventually both managers and employees began exerting pressure on PNB to develop a company-wide policy.

Employee Involvement

In January, 1983, a Smoking Issues Steering Committee was established consisting of smokers, nonsmokers, and a group often forgotten, former smokers. Employees representing their unions and from the legal, health services, safety, and many operating departments were part of the task force. One of its first undertakings, an employee survey, brought an astonishing 74 percent response rate, attesting to the importance of the issue among workers. In addition to comments from those who were randomly surveyed, 151 people who were not part of the survey group made the effort to get copies from their friends so they, too, could have their view heard. They included 135 nonsmokers and 16 smokers.

Results of the 1983 questionnaire showed that 28 percent of PNB employees smoked, but that the majority of employees were bothered at least occasionally by smoke at the workplace, and almost 80 percent said the company should be concerned about smoking at the worksite.

Two-and-one-half years after its inception--following a great deal of research and discussion by the task force, as well as involvement in the issue by numerous Quality of Work Life teams and various ad hoc groups--the employee committee recommended to the officers that smoking be eliminated at PNB.

Union Involvement

At PNB, unions were instrumental in all phases of policy development. Not only were they included in the employee committee making recommendations about a future policy, but leaders of both unions were part of the June 1985 presentation to the company president of the committee's recommendation. "They were not there as advocates for a no smoking worksite," cautions Len Beil, director of human resources planning and employee involvement. "They were present, rather, to state that they had been involved in the process and what their positions would be on a strong policy. While they did not endorse the complete elimination of smoking in all buildings, they stated that their unions would not formally fight its implementation, either."

Beil adds that the union members on the committee were "extremely helpful" in all aspects of policy development, and that while they never fought against the policy, they negotiated successfully for several compromises that proved to be fair and beneficial for all employees. Initially, the company wanted to reimburse employees for smoking cessation classes after successful completion. The union position was that PNB's goal was to assist and encourage employees to live with the policy and comply with it--not necessary to get them to stop smoking. Therefore, they pressed, the company should reimburse totally for cessation classes, whether or not the employee completed the series. On the issue of smoking in company vehicles, union representatives stressed the difficulty of enforcement and potential problems if cigarette butts were found in a company car or truck ash tray. On both issues, PNB went with the unions' requests. All employees got full reimbursement for taking a cessation class and smoking in company vehicles is a matter of "common courtesy." The unions also urged that any policy be consistent throughout all company locations and for all employees.

Education

The day the policy was announced, which was 90 days before the policy was to go in effect, PNB provided two telephone hot lines to answer questions about the policy and provide information on free cessation programs for employees and their dependents.¹⁴ A wide range of quit opportunities were made available, many on company time, with PNB paying all fees following completion. But PNB also garnered kudos from many employees by allowing them to take classes outside the company and still get reimbursement. The ability to choose their own quit method seemed to add to their commitment to succeed and helped encourage a friendlier attitude toward the policy.

Benefits

Within the first two years, 1,738 people had gone through cessation programs--1,353 of them employees, 360 spouses, and 25 dependents--receiving full reimbursement from the company for a cost of about \$250,000. Is this investment worth it to PNB? "Yes," says Beil. "It is money well spent. This equals the cost of just two or three cancers cases. And we would much rather pay for 1,738 to try to quit smoking than pay the results of their continued habit."

Enforcement

PNB reports that there have been "no real problems" with enforcement. On the first day, there were reports that one or two people were smoking behind closed doors in several locations. But "word got around" and by the second day they were abiding by the rules. Although several people threatened to contact lawyers and a few employees tried to organize a Smokers Rights day, nothing significant came from any of the attempts to block implementation.

The bottom line: After two years, no one has quit because of the no smoking policy, there have been no grievances, and smokers at PNB have dropped from 28 percent to 20 percent in the two years since implementation. All in all, the company views its no smoking policy as an unqualified success.

SUMMARY

1. The movement of businesses to develop and implement smoking control policies appears to be strong, and gaining momentum.
2. Employees and unions should be involved in the development and implementation of workplace smoking policies.
3. Enforcement of smoke-free workplace policies has not proved to be a real problem for business.

REFERENCES

1. Office of Disease Prevention and Health Promotion, National Survey of Worksite Health Promotion Activities, U.S. Department of Health and Human Services, 1987, Washington, DC.
2. The Washington Post, "Around the nation: Many firms limit smoking," Washington, DC, February 23, 1988.
3. Hay/Huggins Benefits Report, November 17, 1989, Philadelphia.
4. American Lung Association, "Summary of results of the 1989 survey on public attitudes toward smoking," Nov. 1989, New York.
5. Tripp, J, "Tobacco smoke disappearing in workplace: Employers impose ban" The Oregonian, March 17, 1986.
6. Read, K. "Smoking bans: Corporate cold turkey," Corporate Fitness: The Journal for Employee Health and Wellness Programs, Aug/Sept 1987.
7. Kaiser, J and Behrens, R, Health Promotion and the Labor Union Movement, Washington Business Group on Health, July 1986. Washington, DC.
8. Smoking Policy Institute, "Smoking policies and the unions." 1986. Seattle, WA.
9. U.S. Department of Health and Human Services, The Health Consequences of Smoking: Nicotine Addiction--A Report of the Surgeon General, 1988, Office on Smoking and Health, Rockville, Md
10. U.S. Department of Health and Human Services, Office on Smoking and Health. The Health Consequences of Smoking--Cancer: A Report of the Surgeon General. U. S. Government Printing Office, Washington, DC. Secondary Source: Office of Disease Prevention and Health Promotion, A Decision Maker's Guide to Smoking at the Worksite, 1985.
11. Office of Disease Prevention and Health Promotion. A Decision Maker's Guide to Smoking at the Worksite. U.S. Department of Health and Human Services, 1985..
12. Yenney, SL, Using Incentives to Promote Employee Health, Washington Business Group on Health, 1985. Washington, DC.
13. Behrens, R. Reducing Smoking at the Workplace, Washington Business Group on Health, 1985. Washington, DC.

14. Bureau of National Affairs, Where There's Smoke: Problems and Policies Concerning Smoking in the Workplace, Washington, DC.

CHAPTER 11, APPENDIX

IS THERE ECONOMIC JUSTIFICATION FOR
NO SMOKING POLICIES AT THE WORKSITE?

By Ruth Behrens*
Washington Business Group on Health

The health hazards of smoking--including smoking at the workplace--have been well documented. Smoking greatly increases an individual's chances of contracting serious illnesses, such as cancer, chronic bronchitis, emphysema, and coronary heart disease, and of dying prematurely as a result of these diseases. There is little doubt that smoking also has a significant economic impact. It is estimated that businesses pay over \$100 billion per year in health care costs. A significant portion of this bill is the result of smoking, and is paid out through insurance premiums for employees, dependents, and retirees who smoke or breathe second-hand smoke, as well as for nonemployees who smoke or breathe others' smoke through programs supported by state and local taxes. In other words, smoking is costing businesses a lot of money.

How much does smoking cost U.S. businesses? No one knows exactly. But a growing list of researchers are tackling the difficult job of attempting to identify these costs.

Costs of Smoking to the Nation

At least three major studies have addressed the question of what smoking is costing the nation.

In 1978, Luce and Schweitzer estimated the economic costs of smoking in the United States to be \$47.6 billion. They further broke this down to \$811 per adult smoker, or \$1.56 per pack of cigarettes sold.¹

In 1985, the Office of Technology Assessment, U.S. Congress (OTA), estimated that smoking costs the nation about \$65 billion per year in lost productivity and health care costs alone. OTA estimates that smoking-caused illness results in \$43 billion in lost productivity annually (or \$1.45 for each pack of cigarettes sold), expenses borne largely by employers. Businesses also pay a significant portion of another \$22 billion in smoking-related health care costs, since nearly two-thirds of the costs are incurred by those under 65. According to the OTA, combined lost productivity and health costs related to smoking equal \$2.17 per pack of cigarettes sold.²

Most recently in 1986, a group of researchers, which included the former director of the government's National Center for Health Statistics, concluded that smoking costs the United States at least \$53.7 billion each year in direct medical costs and salary losses alone. These cost estimates were calculated by comparing the health costs and income losses from smokers in excess of the same amounts incurred by nonsmokers. The study concluded that smokers are sicker and require more medical care than nonsmokers.³

The components of the \$53.7 price tag were broken out as follows.

- o Direct medical costs such as doctor bills, drugs, and hospital and nursing home expenses were \$23.3 billion more for smokers than the average of nonsmokers.
- o A total of nearly \$9.3 billion was lost in salaries due to smokers being sick with smoking-related diseases including lung cancer, heart attacks, stroke, emphysema, and other respiratory illnesses.
- o In 1984, lifetime earning losses from smoking related deaths were approximately \$21.1 billion.

The authors characterize their findings as "conservative" since they "did not take into account the adverse effects of passive smoking, risks of abortions, stillbirths, and neonatal deaths, or deaths under age 20 that might be associated with smoking."

In their paper published in The Milbank Quarterly, Rice et al translated all three of these studies to 1984 dollars. The result is three analyses of the economic impact of smoking on the nation that demonstrate enough similarity to underscore that smoking does, indeed cost our country a staggering amount:

- o Luce & Schweitzer show a cost to the nation of \$52.8 billion per year in 1984 dollars;
- o OTA, \$62.2 billion in 1984 dollars; and
- o Rice et al, \$53.7 billion in 1984 dollars.³

Differing Methodologies Make Pinpointing Worksite Costs Hard

A number of researchers also have attempted to assess the specific costs of smoking to businesses. But many problems arise when attempting to identify one, or even a "best" methodology for arriving at these costs.

Among the difficulties in conducting any study of the costs of smoking is the fact that smokers differ from nonsmokers in several genetic, social, and economic characteristics that may contribute to disease. For example, the prevalence of smoking varies by race (more blacks smoke than whites), education (fewer college graduates

smoke than persons with only some high school), income (males with lower income smoke more, while the opposite holds for women), and occupation (blue collar workers smoke more than professional or technical workers). If factors known to be related to health status and smoking habits are not controlled, the impact of smoking on health and the costs of smoking may be overstated.³

When examining smoking in the worksite, specifically, other methodologic issues must be resolved. Marvin M. Kristein and William Weis both published studies in the early 1980s identifying the cost to business of each smoking employee. Kristein estimated the cost in 1980 dollars to be between \$336 and \$601 per smoker annually,⁴ while Weis placed the figure nearer \$4500.⁵ These findings are now outdated; in an article published in 1989, Kristein has stated that "...the typical smoking employee in 1988 cost the typical employer at least \$1000 in excess costs" compared to a similar nonsmoker.⁶ However, a look at why their conclusions differed 10 fold dramatically illustrates two points: 1) the difficulty of pinpointing the cost of smoking to businesses, and 2) the wide range of business costs that can be affected by environmental tobacco smoke.

Much of the rather staggering discrepancy between the two studies is attributable to their selection of different categories of costs to include in the equation, the weight given each category, and the salary assigned to the average smoker.

According to Weis, business costs in at least ten areas are affected by smoking or smoking controls, including no smoking policies: health insurance; incremental absenteeism; life and disability insurance; fire, liability and industrial accident insurance; ventilation and energy consumption for heating and air conditioning; legal liability; property damage, depreciation and maintenance; time lost to the smoking ritual, employee morale, and corporate image.⁷ Kristein factors in health and life insurance, fire losses, workers' compensation costs, absenteeism, productivity, and occupational health costs. (In a 1984 article, Kristein looked at only short-term costs and included fire, accidents, ventilation, cleaning, productivity, and occupational health risks.)⁸

To help illustrate the differences between Kristein and Weis's total smoking-related costs, one can look at how each calculates the costs of absenteeism to employers due to smoking.

Weis uses government data that shows a smoker is absent 2.2 days per year more than a nonsmoker. Using \$30,000 per employee as the average annual wage and salary, including fringe and payroll taxes, the company pays approximately \$120 per working day for every employee on the payroll. Assuming a 25 percent return on payroll dollars, the direct cost to the employer is \$150 per absence, excluding the cost of temporary replacements. According to this

formula, the total cost per smoker per year due to absenteeism is \$310. A similar system is used by Weis in determining costs in other categories.

Kristein, on the other hand, used 1979 data showing smokers are absent 33 to 45 percent more than nonsmokers, or 2.0 days more per year, and assigns a daily salary of just \$40 per smoker due to smoking (versus \$150 for Weis). Thus Kristein includes from \$40 to \$80 per smoker per year attributable to absenteeism in his total (versus \$310 for Weis).²

While Kristein's estimates are based on what he called "real numbers" drawn from insurance companies, U.S. government statistics, and detailed academic studies, he cautions, "We lack meaningful 'case controlled' company comparisons of experience with smoking employees versus nonsmoking employees....In general, the emphasis is on underestimating the costs to business."⁹

Economic Impact of Smokers on the Worksite

Evidence also shows that, in addition to excess absences of two or more days per year, smokers exert other types of economic impacts on businesses over their nonsmoking counterparts. Studies have shown that:

- o smokers have twice as many job related accidents as nonsmokers.¹⁰
- o Smokers are 50 percent more likely to be hospitalized than those who do not smoke.
- o Employers have been held legally responsible for at least part of the disability cost for smoking employees who contracted smoking related illnesses, in addition to claims from nonsmoking employees who were adversely affected by the smoke of others.¹¹
- o Companies with certain occupational hazards can expect greatly increased costs related to smoking. For example, an asbestos worker who smokes is ten times more likely to die prematurely than his nonsmoking coworkers. A smoking uranium miner has six times the risk of contracting lung cancer as a nonsmoker in the same job.

In addition, many health consequences of smoking translate directly into increased health care costs, since employers pay for a major portion of these costs for their employees, dependents, and retirees.

- o Heavy smokers (two or more packs a day) are 15 to 25 times more likely to die of lung cancer than nonsmokers, and

overall, smokers are ten times more likely to die of lung cancer than nonsmokers.¹²

- o Eighty to 90 percent of such long term severe lung diseases as emphysema and chronic bronchitis are related to smoking.¹³
- o It is estimated that 30 percent of all cancers are caused by smoking. That means that 138,000 Americans died of cancer in 1986 because of smoking.¹³
- o Heavy smokers are three to four times more likely to die of cancer than nonsmokers and overall, the risk to smokers is two times greater than for those who don't smoke.¹²
- o More than 550,000 Americans will die of coronary heart disease this year, and up to 30 percent of those deaths will be attributable to cigarette smoking.¹⁴
- o Heavy smokers have a 200 percent greater risk of dying from coronary heart disease than nonsmokers, and overall, the risk for all smokers regardless of the amount smoked, is 70 percent greater than for those who don't smoke.¹⁴
- o Evidence demonstrates that smoking during pregnancy has a significant adverse effect upon the well being of the fetus and the health of the newborn, including causing lower birth weight infants and increasing the risk of spontaneous abortion and neonatal deaths.¹⁰
- o Children of smoking parents have increased prevalence of respiratory symptoms and have an increased frequency of bronchitis and pneumonia early in life.¹³

Two studies relate smoking directly with costly health-related events, stroke and automobile accidents.

A study has concluded that smokers who quit can decrease their risk of having a stroke by more than half when compared to those who continue to smoke, thus cutting dramatically their potential health care costs.¹⁵

A two-year study in Worcester County, Massachusetts, comparing the motor vehicle driving records of smokers with nonsmokers found that smokers had 50 percent more accidents than nonsmokers and 46 percent more traffic violations. The study identified several reasons for the smokers' increased risk of being involved in costly accidents and violations, including

- o smokers' more frequent use of alcohol and drugs,
- o smokers' greater risk-taking behavior, and

- o smokers' diminished attention to driving due to the distractions associated with smoking.¹⁶

Individual Companies Document Costs, Consequences of Smoking

While studies conducted by individual companies have varying degrees of validity, they do offer some further insights into the price businesses pay for their smoking employees.

In a study of 40,000 employees at 27 locations of the Control Data Corporation, CDC found that smokers cost the company substantially more in health related costs than nonsmokers. The study, using health data collected from 1981 to 1984, found:

- o Smokers of one pack of cigarettes per day or more generate health claims 18 percent higher than nonsmokers.
- o Smokers of one cigarette to one pack per day accrue claims costs 10 percent higher than nonsmokers.
- o Heavy smokers have 25 percent more inpatient days than their counterparts who do not smoke.
- o Heavy smokers are 29 percent more likely to have health claims over \$5,000 than those who do not smoke.¹⁷

One Los Angeles company estimates production losses alone at \$675 per smoker per year. Adding longer term costs such as absenteeism, premature death, and illness would raise the cost to at least \$1,000 per year for each smoker.¹⁸

Provident Indemnity Life Insurance Company charges its smoking employees the excess rate of their insurance coverage over that of nonsmokers, an amount in the vicinity of \$300 per year.¹⁹

Smoking and the Bottom Line

When viewed in the aggregate, these studies may appear to make a compelling case for the potential of smoking control programs and policies to significantly cut long-term business costs. However, a number of researchers, including health promotion and smoking control advocates, point out that this conclusion may not be justified. In some cases, the studies presented have significant methodological problems or their underlying assumptions may be flawed. Equally important, the total costs of developing and implementing smoking control programs and policies, coupled with the increased costs associated with longer life resulting from quitting smoking (pensions, retiree and dependent health care costs), may eliminate any financial gain for the company.

Following are several examples and studies illustrating how these supposed cost savings may not be what they initially appear to be.

As is pointed out in this appendix, many of the costs associated with smoking can be attributed to characteristics of smokers (risk-taking style, alcohol and drug use, low socioeconomic status). However, it is unlikely that these basic characteristics would change, even if the individual employee was induced to stop smoking.

A portion of the supposed economic penalty associated with hiring smokers results from an increase in absenteeism seen in employees who smoke. Statistics indicate that people who smoke are eight times more likely than nonsmokers to have alcoholism. Thus, helping current employees stop smoking might not have the expected effect on absenteeism, since in some, alcoholism also is a root cause of the absenteeism.²⁰

Some argue that smokers already are "paying their own way" through cigarette excise taxes. In examining the lifetime costs that smokers impose on others through collectively financed health insurance, pensions, disability insurance, group life insurance, fires, motor-vehicle accidents, and the criminal justice system, Willard G. Manning, et al, conclude that on balance, smokers probably pay for their own costs to society under the current level of excise tax on cigarettes.²¹

According to Kenneth E. Warner, Ph.D., a successful workplace smoking cessation program will reduce certain health care costs, life insurance costs, disability costs, and absenteeism, and it may increase productivity as well. "However," he adds, "one thing that it is almost certain to do, by virtue of its success, is to extend the lives of a subset of employees well into retirement, implying both pension and health care (and other) cost implications...."²²

Warner concludes that when all costs are taken into account--such as, for example, the increased costs of pensions, health care, and disability for retired workers who live longer because they stopped smoking, versus the decreased costs for workers who continued to smoke, die prematurely, and are replaced by a younger, less expensive employee--businesses might very well conclude that, from a purely economic point of view, it may be cheaper to allow employees to continue smoking.²² Louise Russell,²³ Thomas Schelling,²⁴ and others have come to similar conclusions based on cost savings alone.

Individuals such as these, who debunk the idea that smoking control programs will result in cost savings for businesses, do not, however, conclude that it is in best the interest of businesses and society to advocate smoking or to shun smoking control policies.

There are obvious short term benefits of a smoke free workplace, over and above the health-related savings Warner lists above. They include reduced building and equipment cleaning and maintenance costs, reduced costs from fire damage and insurance, reduced energy consumption cost because of reduced ventilation needs, and reduced turnover. In addition, there are the less tangible benefits of a working environment that is perceived as being better by the overwhelming majority of employees, as well as an improved company image.

But for many, the potential of better health for employees, and of eliminating or delaying the onset of degenerative or fatal diseases is the most compelling reason to implement a company-wide smoking control policy.

So the real bottom line for companies considering whether or not to implement a smoking control policy or a smoking ban may not be a simple dollars and cents formula. But rather, the bottom line may be as pragmatic as the need to comply with local legislation, or the desire to improve productivity, as paternalistic as the desire to have happy, loyal employees, or as altruistic the desire to "do the right thing" by providing the most healthful environment for its employees. If costs savings follow, these companies may, themselves, have received a bonus.

SUMMARY

1. Smoking in the workplace increases business costs because the diseases of smoking increase absenteeism and hospitalization, and may increase insurance, disability and legal costs. However, these costs may be offset by the longer lifespan of employees who quit smoking as a result of workplace restrictions, increasing pension costs to employers.

2. The most compelling reason to restrict smoking in the workplace is the potential for better health for both nonsmoking and smoking employees, by eliminating or delaying the onset of degenerative or fatal diseases.

REFERENCES

1. Luce, BL and SO Schweitzer, "Smoking and Alcohol Abuse: A Comparison of their Economic Consequences," New England Journal of Medicine 298, 569-571. 1978
2. Office of Technology Assessment, U.S. Congress. "Smoking-Related Deaths and Financial Costs." (OTA Staff Memorandum). 1985 Washington, DC.
3. Rice, DP, TA Hodgson, P Sinsheimer, W Browner and AN Kopstein. "The Economic Costs of the Health Effects of Smoking, 1984" The Milbank Quarterly. Vol. 64 , No. 4, 1986. Cambridge University Press.
4. Kristein, MM, "How Much Can Business Expect to Profit from Smoking Cessation?" Preventive Medicine, 12, 358-381, 1983.
5. Weis, WL. "No Ifs, ands or Buts: Why Workplace smoking should be banned" Management World, 339-44, Sept 1981.
6. Kristein, MM, "Economic issues related to smoking in the workplace." N.Y. State J Med. 89: 44-47 (1989).
7. Smoking Policy Institute, "The Costs of Smoking in the Workplace," 1986, Seattle, WA.
8. Kristein, MM "Wanted: Smoking Policies for the Work Place," Business and Health, Washington Business Group on Health, Nov. 1984. Washington, DC.
9. Bureau of National Affairs, "Where There's Smoke: Problems & Policies Concerning Smoking in the Workplace," 1986, Washington, DC.
10. U.S. Department of Health, Education and Welfare, Office on Smoking and Health. Smoking and Health: A Report of the Surgeon General. U.S. Government Printing Office, 1979, Washington, DC.
11. American Lung Association, "Smoking at the Workplace: The Changing Legal Situation. More Facts & Features for Nonsmokers & Smokers. 1983. New York, New York.
12. U.S. Department of Health and Human Services, Office on Smoking and Health. The Health Consequences of Smoking--Cancer: A Report of the Surgeon General. U.S. Government Printing Office. 1982. Washington, DC.
13. U.S. Department of Health and Human Services, Office on Smoking and Health. The Health Consequences of Smoking--

- Chronic Obstructive Lung Disease: A Report of the Surgeon General. U.S. Government Printing Office, 1984. Washington, DC.
14. U.S. Department of Health and Human Services, Office on Smoking and Health. The Health Consequences of Smoking--Cardiovascular Disease: A Report of the Surgeon General. U. S. Government Printing Office, 1983. Washington, DC.
 15. Abbott, RD, et a., "Risk of Stroke in Male Cigarette Smokers," New England Journal of Medicine, Sept. 18, 1986 315:717-20.
 16. DiFranza, JR, et al, "The relationship of smoking to motor vehicle accidents and traffic violations," New York State Journal of Medicine, Sept. 1986.
 17. Milliman & Robertson, Inc. Health Risk and Behavior: The Impact on Medical Costs. 1987, Brookfield, WI.
 18. Rice, DP and TA Hodgson, "Economic Costs of Smoking: An Analysis of Data for the U.S.," presented at the Allied Social Science Association annual meeting, San Francisco, CA Dec. 28, 1983.
 19. Behrens, RA. Reducing Smoking at the Workplace. Washington Business Group on Health. Oct 1985. Washington, DC.
 20. Warner, KE, Wickizer, TM, Wolfe, RA, Schildroth, JE, Samuelson, MH. "Economic implications of workplace health promotion programs: review of the literature. J. Occ. Med. 30: 106-112 (1988).
 21. Manning, WG, et al, "The Taxes of Sin: Do Smokers and Drinkers Pay Their Way," Journal of the American Medical Association Vol. 261, No. 11, March 17, 1989.
 22. Warner, KE, "Selling Health Promotion to Corporate America: Uses and Abuses of the Economic Argument," Health Education Quarterly, Vol. 14, No. 1, Spring 1987.
 23. Russell, LB, Is Prevention Better than Cure? Brookings Institute, 1986, Washington, DC.
 24. Schelling, TC, "Economics and Cigarettes," Preventive Medicine, Vol. 15, 1986.

* present address: 3026 East Marlette, Phoenix, AZ 85016